THE
ELECTRICAL REVIEW.

VOL. LXIV. APRIL 2, 1909. No. 1,636.

ELECTRICAL REVIEW.

Vol. LXIV.] CONTENTS: April 2, 1909. [No. 1,636.

	Page
The Electro-Peat Coal Co.	541
The Rights of Patentees	542
Experiments on the Efficiency of Ceiling Fan Blades (*illus.*)	543
The Reduction of Car-Troubles by Systematic Methods (*illus.*)	545
Sales Engineers	545
Correspondence:—	
Batteries and Transmission Lines	546
Faraday House Men	546
Supply by Meter, or Contract?	546
House Wiring	547
West Ham Prophets	547
Polishing Commutators	547
Water-Tube Boiler Patents	547
Whipping Phenomena of Turbo-Alternator Shafts ...	548
Electricity *v.* Gas	548
Electricity in Mines	548
New Electrical Devices, Fittings and Plant (*illus.*)	549
Electric Time Service	551
Parliamentary	551
Legal	551
The Electrical Trades Benevolent Institution	552
Business Notes	554
Notes	562
City Notes	564
Stocks and Shares	568
Market Quotations	568
Share List of Electrical Companies	569
Notes on Brazil	571
The Patents Act, 1907, Expounded	572
Faults on Tramcar Motors...	574
Proceedings of Institutions:—	
Extending the Limits of Power Transmission	575
Electric Traction Vagabond Currents (*illus.*)	577
Sewage Pumping at Milton, Weston-super-Mare (*illus.*) ...	578
Foreign and Colonial Tariffs on Electrical Goods	579
New Patents Applied For, 1909	580
Published Specifications	580

THE ELECTRICAL REVIEW.

Published every FRIDAY Price 4d.

The Oldest Weekly Electrical Paper. Established 1872.

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OFFICE:—4, LUDGATE HILL, LONDON, E.C.

Telegraphic Address: "AGENKAY, LONDON." Code, A B C.

Telephone Nos. Holborn 933 Central 4425 (Editorial only).

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FOREIGN AGENTS.—New York: D. VAN NOSTRAND, 23, Murray Street. TORONTO, ONT.: WM. DAWSON & SONS, LTD., Manning Chambers. Paris: BOYVEAU & CHEVILLET, 22, Rue de la Banque. Berlin: ASHER & Co., Unter den Linden.

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THE
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(J. A. BERLY'S).

1909 EDITION

H. ALABASTER, GATEHOUSE & CO.,
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THE ELECTRO-PEAT COAL CO.

FOR more than a fortnight an able judge and a special jury, with the assistance of eminent members of the Bar, have had under consideration the circumstances connected with the flotation of the Electro-Peat Coal Co. The action was brought by Mr. C. J. Barker, of Ilkley, Yorkshire, and the defendants were the Earl of Mayo, Sir Leslie Falkiner, Colonel St. Quintin, and Messrs. H. Howard Allen, Macgregor and Simpson. The plaintiff, in the words of the learned judge, "was not a baby." He had been engaged in business, had himself been a director of companies, and "having retired on a competency, like some people, tried to get rid of his money by putting it into bad investments." The Electro-Peat Coal Co. was obviously just the kind of investment for the purpose, so Mr. Barker applied for and underwrote shares in that venture. The defendants were the directors and the promoter of the company, and the claim was for the return of the amount of Mr. Barker's investment on the grounds of misrepresentation. The nature of the misrepresentations need not now be set out for the readers of the ELECTRICAL REVIEW as the case has been reported in our pages. In November, 1903, a demonstration of the electro-peat process was given at the works of Messrs. Johnson & Phillips. We attended that demonstration and recorded our impressions. We expressed the view that the effect claimed for the electrical treatment was erroneous, and stated that the answers to our inquiries were unsatisfactory or non-existent. Anticipating as probable the submission of the process to public subscription, we remarked:—

"It must, however, in fairness to the possibly investing public be pointed out that 1 unit of electricity cannot generate more than 3,410 heat units when passed through wet or damp peat, and that probably any rupturing effect is small or purely imaginative. To produce 1 unit of electricity requires 3 lb. of good coal, or a potential calorific power of 45,000 B.TH.U., or thirteenfold the heat potential of the electrical energy it generates. Even if there is more in electrical peat than in electric sugar, we very seriously doubt the value of any process of peat treatment which involves so heavy an expense as must be incurred in generating so much electricity for so small a product of peat."

In the course of our attention to the subject, we pointed out the confusion which had arisen in the reports of the experts between thermal units based on kilogrammes and pounds. The results of such information were shown in the course of the trial by the modifications made in the various estimates between the original reports and the final prospectus, such as the change from the word "produce" to "treated."

The result of the case was to exonerate the directors generally from any legal liability, but to impose upon Mr. Darlington Simpson the responsibility for the payment to the plaintiff of the sum of £910, the jury finding that he

was the promoter of the company and that he authorised the issue of the prospectus of January 20th to be shown to the underwriters of the shares.

In his summing up the Judge remarked that "in a case like this it was necessary to ask who the person was asking relief," and in so far as the proceedings go subsequent to the formation of the original syndicate, it would seem that the judge had formed the opinion that the plaintiff was as much behind the scenes, and in as good a position to know the facts, as the directors themselves. The evidence would lead to the impression that Mr. Barker embarked in the syndicate in the anticipation of making a good thing out of it by the formation of subsidiary companies or in other ways familiar in the case of speculative enterprises. He was one of those who would benefit by the syndicate's resale to the company, whilst the defendants, other than Mr. Simpson, were free from any such personal interest, and it is reasonable to suppose that the respective merits of the parties on either hand weighed with the jury in arriving at their verdict.

But whilst congratulating Lord Mayo and his colleagues on the result of the case, we must express our surprise and regret that they should have been associated with the enterprise in any way. Here are men of high standing, and some with no business ability, becoming directors of a company formed to develop the production of peat fuel. Lord Mayo had no peat for sale, and apparently "no axe to grind." He took no director's fees either. What induces such a man to assume the responsibilities of a director, to give his name to the front page of a prospectus and to take his part in the sordid details of allotments? Having undertaken those duties, how does it come about that he is content to rely upon the reports of one or two interested individuals to prove the efficacy of an alleged discovery which is to give an immense value to a hitherto comparatively waste product, whilst he disregards the impartial criticisms and the technical proofs of those who are entirely disinterested? How comes it that these estimable Irish gentlemen can so readily believe (as we must assume they did) that electro-peat coal would bring a remote prosperity to Ireland without realising the possibility that the payments to promoters would bring more immediate disaster to the English investor? Why are such directors blind to what others can see? Why are they deaf to all appeals for inquiry? On the technical details of the process we offered criticisms in ample time for them to have made efficient inquiry before the preparation of any prospectus. On the financial side we said about the time of the issue of the prospectus (Electrical Review, April 22nd, 1904, p. 687): "Before investors risk a penny in this thing, let them obtain advice from other experts than those put forward by the promoters. If not, they will have themselves to blame if they lose their capital." This company exploited a process in which electrical working was alleged to render possible what was unattainable by any previous process. Amongst the directors themselves were men associated with electrical enterprises, and we are justified in assuming that our criticisms were known at least to them, even if they were not brought before the directors generally.

Though exonerated by a jury from any legal liability, we do not doubt that Lord Mayo and his colleagues now regret that they did not pay a little more attention to outside criticisms, and place a little less reliance on the plausible assurances of promoting interests.

Apart from legal aspects, the case shows a singularly loose view of directorial responsibility. It ought to be clearly understood that there is no particular merit in a director not taking his fees whilst he shirks his duty. The proper thing to do is to take the fees and do the work. In this case the work mainly consisted in taking the very obvious means of satisfying themselves that certain statements were true, and that the inferences drawn from them were sound. Both statements and inferences were questioned. The accuracy or inaccuracy of the statements was a matter entirely within the domain of applied science, and the soundness or otherwise of the inferences could have been determined by any average man of business. The legal responsibility has been determined in the directors' favour, but even winning an action is not so satisfactory as having no action brought. Had the directors taken their responsibility to investors more seriously, and made the further inquiries we suggested, it is most probable that no subscriptions would have been invited, and, consequently, no action at law.

The Rights of Patentees.

The judgment of Mr. Justice Parker in the case of *In re* Hatschek's patent, from which we print copious extracts elsewhere in this issue, serves to show that when they passed the Act of 1907, the Legislature meant business. But where does the unfortunate patentee come in? In the first place it is made clear that the Act extends to patentees whose rights accrued before the Act came into operation. It is as if the Workmen's Compensation Act had been declared applicable to injuries sustained by accident before the measure came into force. A patentee who takes out a patent now, has 14 years in front of him, while in the present case the patent actually revoked, was granted in 1900. Although he states much that is useful in his judgment, Mr. Justice Parker appears to have failed to consider certain important points. Suppose there are not the proper materials for the particular manufacture in this country. How does that affect the question of manufacture abroad rather than on these shores? Again, in the case before the Court, the patent was granted in 1900, for the manufacture of stone tiles or slabs. Although worked in France, Germany and Belgium, it was never worked in this country. The learned judge holds that a patentee cannot excuse himself by saying that the patent cannot be profitably worked in this country. Hence the question whether the patentee could have made a profit here was immaterial. But what, it may be asked, are the learned judge's views as to the normal working of an article for which a patent is taken out in this country? His judgment throws no light on this point. He deals with the matter solely from the point of view of whether the patent was worked here. As a general rule, an inventor, whether English, German or French, patents his invention in his own country and abroad. He commences business in his native land by getting up a company to work his patent, and he tries to dispose of his patent rights in other countries to people who are ready to take up such business. He, personally, does not visit each country and start works to manufacture his invention. Presumably, in the present case, the patentee was a German or a Dutchman, and he has started his own works in Germany or Holland and disposed of his other patent rights in France and Belgium to companies who have also thought it worth while to start manufacturing. He may have tried over and over again to dispose of his English rights without success, and now, because nobody has thought it worth while to buy them up and start business, he is deprived of the five years the patent would have had to run, in which time somebody might have come along to work the invention in England. This is English patent law "as she is administered," and as she will be administered in the future. Would-be patentees know where the shoe will pinch them; but it appears to us to press somewhat hardly upon persons who had obtained monopolies before the Act was passed.

EXPERIMENTS ON THE EFFICIENCY OF CEILING FAN BLADES.

By L. MURPHY, A.M.I.E.E., East London College.

In tropical countries the efficiency of ceiling fans is a matter of great importance, as the energy consumed by these may be considerably more than that required for lighting. In designing motors for this purpose, the author has found no reliable data as to the power consumed by the various forms of blades in use, and, in view of the obvious fact that some blade forms were much more efficient than others, the experiments described below were carried out.

Method.—The method employed for measuring the power consumed by the blades was a direct one corresponding to what is known as the "cradle" method of testing motors and generators. The motor was hung from a vertical ball bearing *b* (fig. 1), and an arm was attached at right angles to the suspending rod. When at work the motor will exert a reacting torque upon its support equal to the driving torque exerted upon the fan blades, and this is balanced by a weight carried in a scale pan s at the end of a fine cord passing over a frictionless pulley to the end of the arm. By this means it was possible to measure the power consumed by the blades to within a torque of 50 gramme-centimetres, representing an accuracy of $\frac{1}{4}$ to $\frac{1}{2}$ per cent. At the same time the efficiency of the motor could be obtained by measuring the electrical input, and several readings were checked in practice by deducting the measured losses in the motor from the input and comparing the result with the output as measured directly.

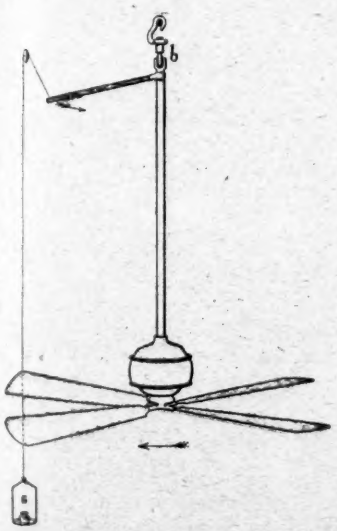


Fig. 1.—Arrangement of Apparatus.

For measuring the draught a horizontal steel rod was fixed at a distance of 1 metre below the blades, in such a way that a small anemometer fixed on it could be moved from a point immediately under the centre radially outwards. One metre was chosen as being about the minimum distance below the blades to avoid gusts. The anemometer was an air displacement measuring instrument, *i.e.*, one whose velocity was proportional to the velocity of the stream in which it was placed. Curves were then obtained (see figs. 2, 3, 4 and 5) giving the air velocity at any distance from the centre. A number of preliminary tests made in various positions indicated that the draught was practically vertical in all cases, but the reading given on the curve is that of the actual velocity, and not the vertical component. The direction of the draught was obtained in the earlier experiments by means of a lambent gas flame, but although satisfactory this method was clumsy, and was afterwards abandoned at the suggestion of Prof. Perry in favour of a piece of unspun silk fibre attached to the end of a wire.

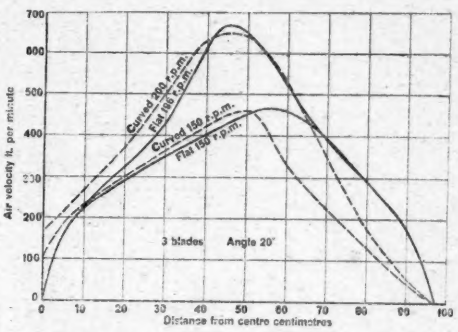
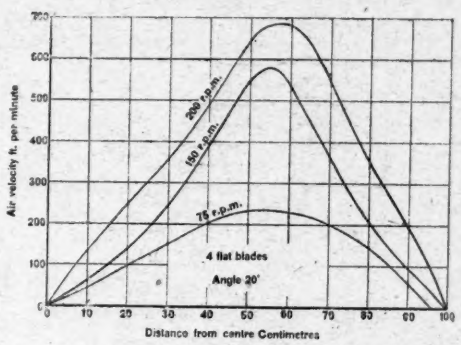


Fig. 2.



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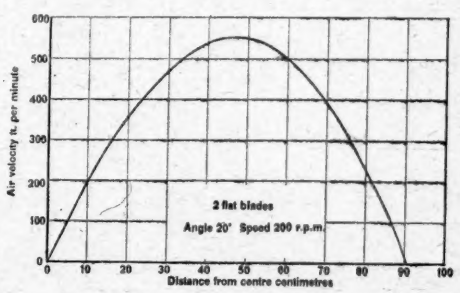

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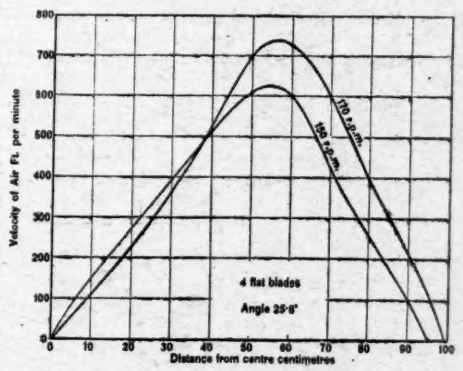


Fig. 5.

Data.—The dimensions of the blades used are given in fig. 7. The curved blades are those used by Messrs. Crompton & Co., Ltd., and are representative of the best practice in this form of blade at present. The flat wooden blades had the same surface as the curved blades would have had if developed flat. The following combinations were tried :—

No.	No. of blades.	Type.	Angle.	R.P.M.
1	2	Flat	20°	200
2	3	"	"	"
3	4	"	"	"
4	3	"	"	150
5	4	"	"	"
6	4	"	"	75
7	4	"	25·8°	170
8	4	"	"	150
9	3	Crompton curved	20°	200
10	3	"	"	150

Theory.—In dealing with the curves obtained, the following points were considered of importance :—

1. Cubic feet of air delivered per minute per watt supplied to blades.

2. Energy imparted to the stream of air. (This figure is of importance in measuring the efficiency of any blade set.)

3. Maximum air velocity obtained.

Referring to point (1). The author suggests that this might be called the "figure of merit" of a blade set of a certain size running at a definite speed. It is not a measure of efficiency but only of the total circulation, and, as will be seen from fig. 6, the slower the blades are run the greater is the volumetric velocity of air delivered per unit of power. The power required to run a set of blades is found by experiment to be proportional to the cube of the speed, while the volume delivered is only directly proportional to the speed. The energy imparted to the stream (point 2) is also proportional to the cube of its velocity; thus, if—

m = mass of unit volume in grammes,

v = velocity in cm. per second,

$\frac{1}{2} m v^2$ = kinetic energy of unit volume in ergs.

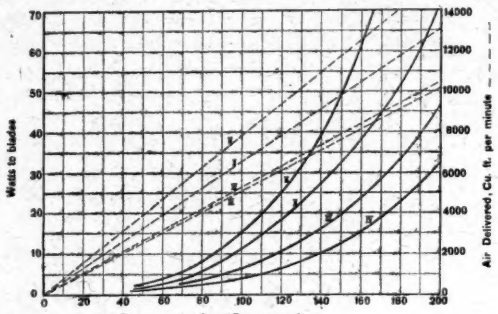


Fig. 6.

Note.—Curves I apply to a set of four flat blades at an angle of 20°; II apply to four flat blades, angle 25·8°; III to two flat blades, angle 20°; IV to three Crompton blades, angle 25°. The dotted curves are only approximate.

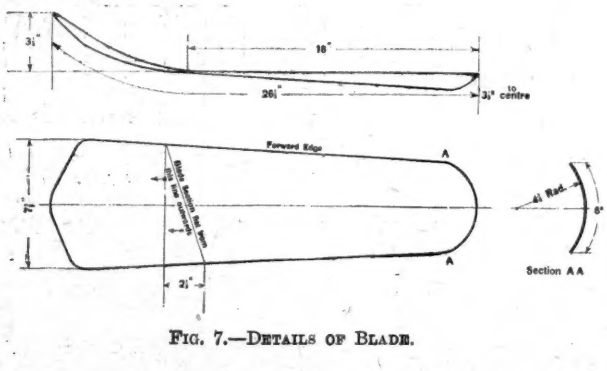


Fig. 7.—Details of Blade.

If x = cu. cm. per second in stream distributed over area A sq. cm. (then $x = v \times A$)—

$\frac{1}{2} m v^2 x$ = power in stream in ergs per sec.

$\frac{1}{2} m v^3 A/10^7$ = power in stream in watts.

m was taken as $1{\cdot}23 \times 10^{-3}$ grammes per cm.^{3} for all tests, as the temperature was approximately constant at 15° C. The barometric variation was not of importance. As the velocity varied considerably at different distances from the centre, it was necessary to estimate the power in the stream from a number of narrow annular rings. The width of ring adopted was 10 cm., so that some inaccuracy will doubtless be found in the results due to the imperfect integration. This does not probably amount, however, to more than a 3 per cent. error, while the labour involved in taking narrower rings is prohibitive. The power given to the blades is given by the expression—

$$2 \pi r n w \times 987 \times 10^{-7} \div 60 \text{ watts},$$

where n = revolutions per minute; r = radius of arm in cm.; w = weight of scale pan s and weights in grammes.

Results.—The following results were then obtained :—

Blade set number.	Max. velocity. Ft. per min.	Cb. ft. per minute.	Watts in stream.	Watts to blades.	Figure of merit.	Efficiency of blades.
1	550	10,258	16·3	46·2	213	·354
2	665	12,026	20·6	57·2	211	·36
3	680	12,916	29·6	72·2	179	·41
4	475	12,365	11·2	26·95	384	·415
5	675	9,398	12·37	35·6	288	·38
6	230	4,678	1·44	4·4	1,032	·328
7	730	14,147	34·4	76·3	186	·452
8	625	11,202	20·1	49·7	236	·42
9	650	10,858	20·94	32	342·0	·655
10	470	7,386	6·65	14·2	520	·47

The first three results compare the effects in the case of blades all set at one angle to the horizontal but varying in number. It will be observed that the energy imparted to the stream of air (column 4) is approximately proportional to the number of blades, but that the maximum velocity tends to increase, and the cubic feet per minute per watt tends to decrease with an increased number of blades. Blade sets (2) and (4), and (3) and (5) respectively, show the effect of reducing the speed from 200 R.P.M. to 150 R.P.M. in the case of three and four blades respectively.

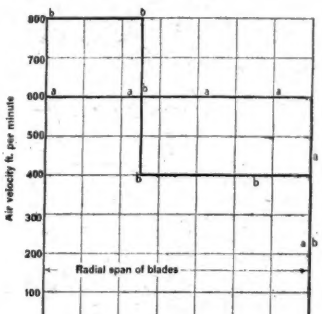


Fig. 8.

Contrary to the author's expectations, a decrease of speed is accompanied by a decrease of efficiency in each case, and this is further demonstrated in blade set (6), where a further drop in speed with four blades results in a further drop in efficiency. It is at the same time apparent, however, that while this diminution in energy efficiency is small, the "figure of merit" in column (6) increases enormously.

The increased angle (25·8°) adopted in blade sets (7) and (8) was first tested (7) at the same power input as was required to run the same blades at 200 R.P.M. at an angle of 20°. (At 150 R.P.M. the tangent of 25·8° multiplied by the speed gives the same figure as the tangent 20° × 200 R.P.M.; see also fig. 9 and context.) It will be seen that the increased angle has resulted in an increased efficiency and an increased "figure of merit" for any power input. The maximum velocity for a given power is about the same, and the same decrease of efficiency at the lower speed is shown.

Blade sets (9) and (10) show an enormous advantage in the use of curved blades, but the efficiency is again low at the low speed. With reference to the flat blades, there is little doubt that the most advantageous arrangement is one having a fairly steep angle, although this must be run at a low speed (say 170 R.P.M. with blade angle 25° and sweep 60 in.).

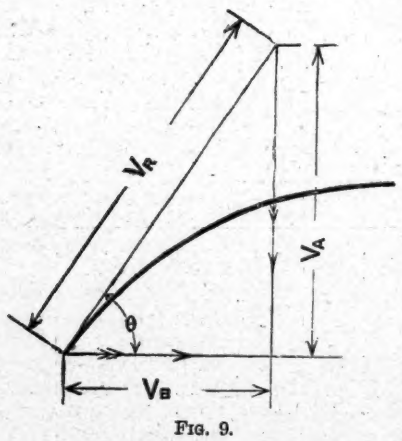


Fig. 9.

This low speed tends also to quietness, and if the number or size of blades is reduced to get the same output at a higher speed, the resulting arrangement is very noisy, and probably not much more efficient, on account of the decrease of blade area. Manufacturers should therefore aim at producing efficient motors to drive the blades at about this speed, if wooden blades are to be used. The curved aluminium blades are very expensive, but will probably pay the consumer to use on account of their much greater efficiency.

The *ideal blade shape* will be one designed much in the same way as a steam turbine blade. The designer must first decide what form of distribution curve is desired, and remember that the more nearly the linear velocity approaches a constant figure over the whole area the higher will be the "figure of merit."

For fans that are to be hung very high there is no doubt, therefore, that the distribution to be aimed at would be that represented by a straight line, as at fig. 8 (*a*), but possibly it might be of advantage to produce a peak in the curve for fans that are to be hung low over desks, &c., as, say, fig. 8 (*b*). Suppose v_b (fig. 9) to represent the horizontal linear velocity of the blade at any point, and v_a the linear velocity of the air downward, then v_r represents the linear velocity of the air relative to the blade at the moment of leaving. It therefore follows that the trailing edge of the blade should be shaped to the angle θ with the horizontal. The leading edge should be horizontal, and a smooth cycloidal curve should join the leading and trailing edges.

In practice it will be wise to keep the leading edge, say, 5° above the horizontal to avoid any chance of any air being forced upward, while it is doubtful if it would ever be desirable to increase the trailing angle beyond 75° on account of churning. Any further increase in efficiency from this point must be made in the motor.

Tests show that the average efficiency of this class of machine is not more than 30 per cent. This could be greatly improved (especially in the case of alternating-current machines) by fitting a simple reduction gear so that the motor might run at 1,500 to 2,000 R.P.M. It would also then be possible to arrange that some of the speed regulation might be done by a diverter resistance on the field, in the most common case of the D.C. series machine, instead of by series regulation.

On these points, together with the suggested blade shape, the author hopes to publish some further matter.

In conclusion, the author wishes to express his thanks to Prof. J. T. Morris and the Governors of the East London College for facilities in carrying out the above tests, and to Messrs. Crompton & Co., Ltd., for the loan of one of their machines.

THE REDUCTION OF CAR TROUBLES BY SYSTEMATIC RECORDS.

An article in the *Electric Railway Journal* for February 13th illustrates forcibly the all-round improvement in car-working which can be got by testing, overhauling and training. On the Boston lines a system of defect records is credited with the following reductions in failures in the past year, as compared with 1907 :—

	1907.	1908.	*Improvement.*
Car body defects	510	400	20%
Motor "	720	240	66%
Truck "	65	16	75%
Control "	275	172	34%
Brakes "	80	31	60%
Groundless reports ...	150	41	73%

Doubtless the inauguration of a searching system of defect records helped to smarten up the whole staff in the car-sheds, repair shops and cars, and it is evident that demonstrative methods of education have borne fruit and will continue to do so.

The electrical engineer of the company attaches much importance to correct acceleration from the point of view of station capacity and motor-commutating capacity. Both points are driven home well by the following ammeter records, which were taken off a car that is used for these educative tests :—

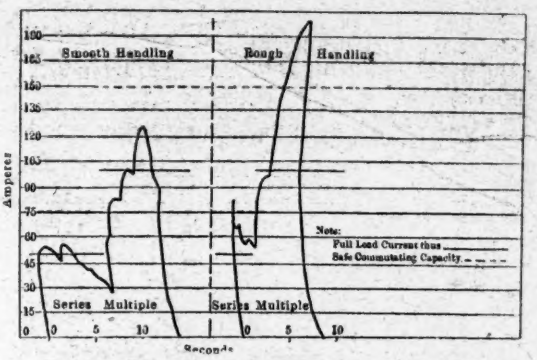


Fig. 1.—Correct and Incorrect Acceleration.

With proper use of the controller the current did not rise above the safe commutating capacity of the motor, and barely exceeded the full-load current. With rough handling the full-load current was exceeded on both series and parallel notches, and the safe commutating capacity was exceeded considerably.

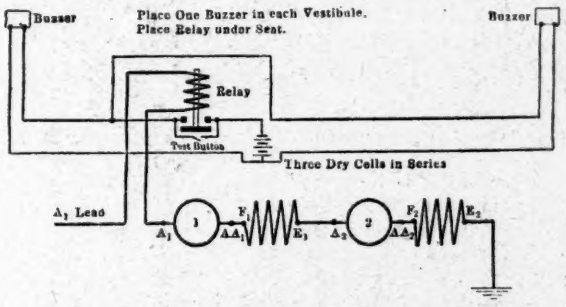


Fig. 2.—Diagram of Overload Buzzer Connections.

A device, which warns the driver when the commutating capacity is exceeded, is being tried on the Boston cars, and we reproduce in fig. 2 a self-explanatory diagram of connections.

SALES ENGINEERS.

By E. KILBURN SCOTT, A.M.I.C.E.

The writer has come to the conclusion that the electrica engineering profession is suffering from the fact that many who are engaged in the executive and sales side of the business have no qualifications as engineers.

Many of them have apparently drifted into the positions they occupy, from being clerks in the office of an engineering or hardware factory, or an importing house. By reading engineering correspondence and price lists, &c., they have acquired a superficial knowledge which, combined with a glibness of tongue, carries them along, and is sufficient to impress the non-technical.

Unbounded assurance prevents them noticing what a trial they are to those who have been through a laborious detailed engineering training, and whose experience is from A to Z, and not merely from, say, Q to X.

The general public judges a profession or business by the kind of men it meets, and when it sees men who have been clerks, travellers, and in some cases failures in other lines of work, suddenly blossom into electrical engineers, then it naturally jumps to conclusions not altogether complimentary. Such positions as sales engineers, secretaries and directors of engineering companies, should be occupied by engineers having executive and financial ability, and at present this is not the case.

Owing to the purely technical methods of training now in vogue, men with financial, as well as engineering, ability are

rare, but the training can be, and should be, given. For example, the engineering departments of our Universities and Technical Colleges should give their students some commercial instruction, even if doing so means lengthening the course. Otherwise the highly-trained engineer will continue to play second fiddle to the accountants and promoted clerks, or what is worse, get into the hands of company promoters who will exploit his expert knowledge.

The position of sales engineer is an important and lucrative one, and it would be well to ensure that those who occupy such positions are really engineers by training.

Some years ago it was part of the writer's duty to interview callers who were introducing engineering specialities, and he wasted so much time hearing balderdash from the untrained and glib spoken, and received so much really useful information from the trained engineer, that he decided upon the following course :—

To see only those representatives who were able to write Associate Member of Electrical, Mechanical or Civil Engineers on their visiting cards.

If all who have to give much time in interviews would take this course, it would quickly ensure the positions of sales engineers being given to those who were properly qualified. At the same time it would do a good turn to the several engineering institutions, for the writer is one of those who places greater value on membership of one of the institutions than on an engineering degree. The former necessitates much actual experience, whilst the latter may be held by a raw young man straight from the university, who has yet to prove whether he will prove to be a success as a practical engineer.

The writer thinks that in the future it will be from the ranks of sales engineers that the business and executive heads of the profession will be obtained, and he looks forward to the time when all electrical engineering businesses will be run by such engineers. In the past many manufacturing firms have failed because they have been run too much from the accountants' side instead of from the engineers' department.

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

Batteries and Transmission Lines.

Mr. Orsettich's communication to the discussion on my recent paper arrived too late to be replied to, along with other speakers ; and as this has, contrary to my anticipation, been published along with other contributions, I would like, with your permission, to say a few words now in reply.

Mr. Orsettich has somewhat lost the point of my paper, and his remarks, though perfectly sound, do not, therefore, invalidate my arguments. He assumes that any existing transmission scheme can double its voltage. Doubtless this is so for short transmissions, but I was considering the case of a long transmission on which it was necessary from the first to adopt the *highest* feasible voltage.

Given a limit in the voltage, my contention is that it is possible with storage to consider a transmission over a distance that would otherwise be impracticable. I do not see that it is in the least material whether I have chosen too low a limit for consideration, or otherwise.

The next point on which I find myself in disagreement with Mr. Orsettich is in his statement as to the objection to converting alternating current into continuous, "with its well-known handicap of rotating machinery and expensive switchgear."

He evidently has not realised that I propose to pay for the above, as well as the cells, out of the savings in generating plant and head works, and *not* out of savings in the line.

I have cited actual cases where the costs of such head works and generating plant come out at £50 and £60 per KW., and I gather from a paper by K. Thielsch on this subject that £36 to £40 per KW. is a not uncommon figure for the cost of headworks *alone*, without turbines or generators, where the "heads" are low.

So long as the combined cost of headworks, turbines, generators, step-up transformers, switchgear and power house is not less than, say, £15 per KW. (including spares), the accumulators and rotaries could be reckoned as being paid for out of the power house savings, and the line need not be debited with them. I do not suggest using them where the power house costs are less than this, unless the saving in fixed charges will pay for the difference ; which is quite probable, however.

As regards the method of distribution, Mr. Orsettich is wrong in thinking that I would propose to distribute with direct currents.

As regards the last point raised by Mr. Orsettich, I am considerably interested to know who pays for that "large amount of reserve power which can be used to overcome the drop of the line at the moment of maximum demand."

Granted that 60,000 volts may be used ; granted that the limiting distance may be doubled ; granted also that the cost of copper in the line may be reduced to that proposed by me by the simple expedient of allowing a 40 per cent. combined drop in the line ; I still want to know who pays for the extra 20 per cent. of E.M.F. at the generating station at the time of peak load ; not to mention the difficulty of voltage regulation at the sub-station end, with a varying load.

Mr. Orsettich would put in generators having a range in voltage of 40 per cent., or 26 per cent. more than in my proposal (for I have proposals for eliminating the reactance drop) ; and these generators must absorb at least 20-25 per cent. more power than my generators would need to do (because double the load is transmitted), this power costing anything from £15 to £50 per kilowatt, and even then giving unsatisfactory regulation at the distant end of the line. Why not put in batteries and rotaries (for a five-hour peak ; not a few minutes, as Mr. Orsettich seems to figure on) at a cost of £15 per kilowatt, and avoid farther trouble and gain greater reliability of supply against breakdowns, both in line *and* in generating station ?

A. M. Taylor.

King's Heath, *March 25th*, 1909.

Faraday House Men.

Your correspondent, "W. P. H.," in your issue of March 19th stated that "I know of a power house in London where there have been five Faraday House men employed in succession as switchboard attendants for the enormous wage of 5s. per week."

It would materially assist the object of this correspondence if he would disclose the name of the power house in question. As a Faraday House man fairly familiar with what is going on amongst Faraday House students, I doubt the truth of this statement.

A. H. B.

Supply by Meter, or Contract ?

With regard to Mr. Toppin's further letter in to-day's issue, and also the letter from "C. N.," I have already explained in my last letter to you that it was due to my thinking of constants rather than dial readings that I did not notice that the meter would, of course, be going backwards if it were more than 100 per cent. slow.

The test Mr. Toppin got was certainly remarkable, and I should not have expected a meter to start on one lamp if there was so much friction ; at all events, the result was abnormal. There are two points in Mr. Toppin's present letter that I do not agree with. The first is the use of a 5-ampere meter for a load which he mentions is only $1\frac{1}{2}$ amperes. Why did he not use a $1\frac{1}{2}$-ampere meter ? Besides being much cheaper, it has necessarily an ample margin of overload, and would have been quite correct within the limits he mentions. The other point is his finding an average error of 10 per cent. slow at ·28 ampere on a 5-ampere meter. Really good 5-ampere motor-meters will give a practically straight curve down to ·25 ampere, and it is no uncommon thing to find them accu-

rate down to their starting current. On the other hand, electrolytic meters of the type Mr. Toppin evidently has in view are known to have quite a big percentage error, on low loads as well as high loads—a point which surprises a good many people who do not trouble to test them *electrically* because they think they are bound to be correct.

As regards the contract system, it certainly has been tried in a great many places in this country, and in America, of course, it was quite *the* system up to the last two or three years.

On the question of daylight supply only I think most people will agree with me.

Unonot.

March 20th, 1909.

Under the above heading in the current issue of your Review, Mr. W. A. Toppin states that we supply small consumers by contract, also that we give only a daylight supply to same; we should advise your correspondent to make sure of his facts before writing to you. We have not, and do not contemplate, charging by contract; we can only suppose your correspondent has mistaken our two-rate system of charging for a contract system.

H. L. Alderton,
Engineer and Manager.

Guilford Electricity Works,
March 29th, 1909.

House Wiring.

What, if any, are the objections to the use of unprotected lead-covered twin wire for lighting installations in dwelling-houses? Why should the sheath of short runs of L.C. wire (rubber insulated, of course) be continuous?

Failing reasons against it, are there any rules prohibiting its use without mechanical protection and continuous sheath?

Innocent.

March 24th, 1909.

West Ham Prophets.

Evidently one "£10,000 loss" critic has been badly upset by the note in your last issue *re* West Ham Electricity Department Finances.

I need not take up quite so much of your valuable space in replying to my disappointed critic as he required for his criticism.

Under instructions from the Electric Lighting and Tramways Committee, the Borough Treasurer and myself prepared "estimates" as to the financial result of the current year's operations, which were duly reported.

There was not much "estimating" required, because 11 months' expenditure (including capital charges) and revenue were already available, and only the twelfth month remained to estimate for.

When we met for the purpose of comparing figures, it was found that we had each independently arrived at the same figure, viz., £3,000 surplus, and that we had each estimated by about the same amount on what we reckoned the low side.

If your correspondent has had much experience with municipal treasurers, and I would hazard a guess that he *has*, he will know that these gentlemen, unlike electrical engineers, are not apt to put too rosy a complexion on their estimates.

Your correspondent need not worry himself as to costs per unit, he will be quite sick enough when he sees the actual figures to warrant a considerable period of leave for the benefit of his health.

Returning to his criticism, the capital charges have of course increased considerably during the year, and there certainly appears to be more "assumption and guesswork" in his argument than in mine.

Why should he imagine that we are carrying out a huge financial experiment? I really fail to see anything experimental in generating and distributing electricity for power purposes at low prices and on a large scale, which is all we are doing in West Ham, but which certain prominent individuals in the electrical world said we *could not do*, and therein lies the trouble.

A. Hugh Seabrook,
Engineer and Manager.

West Ham Electricity Works,
March 26th, 1909.

Polishing Commutators.

"Chat Noir," in his criticism of my reply to "Conocimiento," has apparently avoided the most important part—*i.e.*, the using of benzoline, which I suggested to be used, for the particular reason of ensuring all "metal polish" being washed off the commutator and out of the mica between the segments.

In many cases it is impossible to remove the "cause," and I can give examples from actual experience to bear out this assertion, if necessary.

I have always observed that much better commutation is the result of using brushes composed of graphite in preference to carbon; and in the majority of cases, where the metal polish and benzoline has been required to be used by me, it has been on commutators on which carbon brushes are used.

I have in mind the case of a 12-H.P. motor fitted with "Morganite" brushes, coupled direct to a feed pump, running continuously for two years and six months without any renewal of brushes, or the commutator receiving attention of any kind other than an occasional wipe over with a dry rag.

It has always been high-voltage machines on which I have used this method of cleaning commutators, having used it on machines giving an output of 1,200 amperes at 550 volts continuously, without experiencing trouble of any kind.

W. P. H.

Eccles, *March 27th*, 1909.

Water-Tube Boiler Patents.

It has come to our knowledge that communications are being circulated by Babcock & Wilcox, Ltd., stating that they have commenced proceedings against us for what they claim to be infringements in certain respects of alleged patents owned by them in connection with water-tube boilers.

These communications are obviously circulated with the intention and in the hope of injuring our business, by means of the suggestion contained in them that our customers will run some serious risk by dealing with us.

It may be that the public are under the impression that Babcock & Wilcox have some sort of monopoly in water-tube boilers, and that the public must either submit to pay their prices or else run risks of patent proceedings.

For the information, however, of any customers of ours who might conceivably be influenced by such tactics, we beg to state the following facts, which we venture to think will sufficiently reassure them:—

1. The only alleged patents in respect of which the action above referred to is brought are the following, namely:—No. 6,221, dated March 26th, 1895 (expired); No. 9,924, dated February 3rd, 1901 (Stirling patent); No. 17,423, dated October 2nd, 1900 (soot cleaning door); No. 11,813, dated May 24th, 1902 (circulating pipes).

2. We are not, in fact, embodying in the water-tube boilers supplied by us any of the alleged inventions purporting to be the subject matter of these patents. Consequently, even if the claim of Babcock & Wilcox, Ltd., is successful, our customers cannot be prejudiced or affected.

3. The alleged patents relate only to minor details, but we are so confident of the inability of Babcock & Wilcox, Ltd., to maintain their validity as effective patents, that we intend to defend the action by all means in our power, with the object of freeing not only ourselves, but the trade generally from what we regard as the incubus of an un-

warranted claim to a monopoly attempted to be set up by that company.

4. We are prepared to give every purchaser of our water-tube boilers an absolute indemnity against all costs, expenses and damages whatever incurred by reason of any claim or proceedings which may be made or taken by Babcock and Wilcox, Ltd., in respect of any boiler supplied by us.

We trust, therefore, that the public will have no hesitation in continuing to place orders with us for our improved water-tube boilers, which we are ready to supply at our usual *reasonable* prices, with a full indemnity as above mentioned.

The Water-Tube Boiler and Engineering Co.,
ARTHUR H. SPEARING.

London, E.C., *March 27th*, 1909.

Whipping Phenomena of Turbo-Alternator Shafts.

I had occasion a few days ago to make inspection (for purposes which need not here be explained) of two Parsons turbo-alternators designed for 750 KW., at 3,000 R.P.M., 50 cycles, and in order to let the firm have the use of one set at a time I had recourse to changing over. I found on running the alternator on no load that at 2,600 revolutions, whipping was obviously apparent; on the turbine speed being increased to 2,750, the whipping, if anything, was slightly increased, and when further increased to 3,000 revolutions, the whipping was lessened and gradually disappeared, but again reappeared. I do not exaggerate when I say that almost two hours was lost in getting the machine to run without vibration; this vibration can be best observed at the slip-ring brushes.

Can any of your many readers suggest a means of getting over the difficulty? Personally, I am of the opinion that the fault is not electrical, but mechanical. I may be wrong, but I can hardly think otherwise. Anyhow, the loss of two hours before synchronism can be effected is a most serious matter to those in charge of machinery of this description, and, no doubt, any engineer who has had actual experience of this whipping action would be doing some good if he were to expound his theory, hypothetical or otherwise.

The rotor exciting voltage is 15. With regard to the stator current, this data would obviously not be of much use, owing to the load being inductive and the machine being run up on no load.

James Graham.

London, *March 30th*, 1909.

Electricity v. Gas.

I rejoice to note in your leading article and in your columns that you have embarked on a campaign that will provide a weapon to defeat the gas companies on their own ground.

Referring to my recently published figures in the daily Press, one gas journal remarked that were my figures correct the public would have no use for gas. Now, here's the rub; my contention is that the public are not aware how cheap electricity has become, and with the extraordinary figures published by the gas companies constantly dangled before them, there is little chance of their knowing, unless electricity wakes up and retaliates on similar lines. No one can fail to admire the ingenious methods employed by the gas companies to promote business; they know full well that the householder or man of business has no use for watt-hours or cubic feet, simply regarding them as terms for experts to conjure with; but what he wants are "facts," and these the gas companies provide in abundance; never mind how far-fetched or impossible they appear to the electrical engineer, they are at least attractive and convincing to the public mind, and result in a considerable amount of success.

Now, it is a simple matter for station engineers and electrical contractors to obtain figures equally attractive and convincing, but reliable, in favour of electricity, and keep them well before the public. The industry is not in such an altogether flourishing state that it can afford to be satisfied with merely weak-kneed or spasmodic effort, but should preserve a well-organised and united front supported by facts and figures of the most attractive kind, and maintain them constantly before the eyes of the public. By this means a satisfactory antidote would be found to declining revenue through metallic-filament lamps. I say "united" advisedly, and in this I do not exclude the electrical Press; for instance, one of your contemporaries referred sarcastically to my interviews with the Press, this was immediately pounced upon by the gas journals and made the most of, a truly regrettable incident. In contra-distinction, however, the gas papers treated Mr. Goodenough's letter—extravagant though it appears—in a manner befitting its publication in their general interest, bearing in mind that every prospective consumer is not a qualified expert, and the explanations made are as simple and graphical as possible.

I am at present engaged in securing actual figures from consumers themselves to prove beyond doubt the great saving to be effected with electricity as compared with gas, and trust others will do the same, and hope still further to show the universal tendency for consumers to increase their lighting concurrently with the proof of their saving over previous corresponding quarters.

Duncan Watson.

London, W.C., *March 28rd*, 1909.

Electricity in Mines.

In the correspondence under the above heading, the question arises who is the man to be put in charge of an installation—a man trained in a shop or the man trained on installation work? The question practically answers itself.

A shop-trained man goes through either the fitting shop, machine shop or winding shop; and as firms specialise and shops specialise, a man leaving either of the above-mentioned shops is a specialist in one little branch of the work carried out by the firm. He would work under the best conditions, with all the best of tools that he would require at hand, and a store of material to draw from. His work is carried out under the most favourable conditions; everything new, clean and dry. The shop man has simple plain sailing with very few difficulties to overcome, and therefore I consider his claims to be an engineer are very small.

On the other hand, a wireman or electrician (a name will not fill an empty stomach) is trained in the laying down, running and upkeep of installations, and owing to his work being scattered over large areas, and to competition, it is not possible to specialise much of his work. Therefore he is trained to carry out any work in connection with the installation from either the boiler, gas producer, oil tank or supply company's terminals to motor or lampholder.

He does not consider it a great feat of engineering skill to skim up a commutator or slip-rings (not even when he has to make the gear to do it with), or take out an armature, or reline or take up a bearing; neither does he wonder what would happen if he did this or that—he generally knows what would happen.

Wire twisting around shop-made articles to keep them from falling to pieces (until he can send them back from where they came, or reconstruct them himself) is a common occurrence to him. Electricians' work is carried out under working conditions which are not always favourable to his work or to himself, with a limited supply of tools and material.

Testing under working conditions is quite another thing to testing on a test plate—where the polish and varnish will carry the article through all the testing that a shopman will give it.

An electrician is trained to work under all sorts of conditions, so that he can easily adapt himself to any surroundings, either in a mansion, down a mine, or afloat.

I should think that it would be to the good of the trade if chief engineers, in selecting their charge engineers for electricity works, would select a little less of the fitter and a little more of the electrician. At present the majority of charge engineers are engine fitters, who have served their time in a shop and afterwards taken a job as a switchboard attendant at 5s. or 10s. a week, and it is these men who have the bounce to call themselves *electrical engineers*. In conclusion, I consider that "Mines Electrical Engineer"

should give his advice and the benefit of his practical experience to his manager in all work connected with the electrical installation under his charge.

Electrician.

Kindly allow me a few words in reply to James Brandreth's letter under the above heading, in which he says a typical wireman's functions are to run wires from point to point, do a little jointing (the less the better), plug walls, run casing and pipe, and do a little simple testing—this is the alpha and omega of his functions as a wireman.

I must say that he is rather ignorant of a wireman's duties; a man who only did the above work would be simply a skilled labourer, and would be classified as a wireman's assistant.

I myself claim to be a wireman, and as such, in defence of wiremen, will give a few particulars of my work:—Erection, fitting-up and wiring of switchboards for continuous and alternating current (lighting and power), and also experimental purposes; wiring for dynamos and motors, and carrying out of ordinary repairs to same; wiring for, repairs to, and maintenance of telephones; charging and upkeep of battery of accumulators; testing not only simple, but fault localisation of light and power mains, by fall of potential and loop methods; high and low-tension jointing, and plumbing on same, all sizes.

In face of this, perhaps he will explain the sentence in his letter:—"A wire twister can run wires, I doubt not, but the man who runs the strings from fiddle peg to tailpiece is not always the player." Is "J. B." always the player?

Registered and Certificated Wireman.

NEW ELECTRICAL DEVICES, FITTINGS, AND PLANT.

Adjustable Chain Bolt.

Machine tools, such as planing machines, have to be provided with quite a large assortment of bolts of different lengths for fixing work, and apart from the initial cost, there is much time wasted in sorting out the necessary bolts for a job. A new bolt (Weaver's patent), which has just been introduced and is shown in the accompanying fig. 1, is made of a chain having the T-head fixed to one end while the other is attached to a head by bending it sharply through a slot. The bolt is lengthened or shortened by

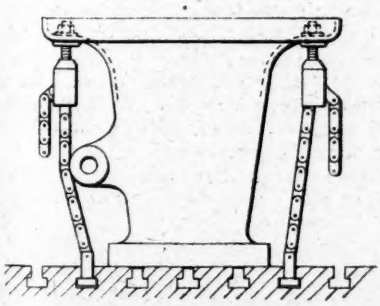


Fig. 1.—Work Secured by Adjustable Chain Bolts.

passing more or less chain through the slot, and can readily be adjusted from a few inches to as many feet in length. Each of these bolts, therefore, takes the place of a whole set of ordinary bolts, the number of bolts required is much reduced, and all bolts are the right length. The bolt, being flexible, can be bent as required, or passed round objects such as cylinders or pipes. Further, instead of lifting the work high to clear the bolts, the bolts can be lowered. The bolts are entirely of steel, and all parts are interchangeable. Prices and dimensions and some further illustrated particulars are given in a circular that has lately been issued by the makers, Messrs. Edward C. Herbert, of Rosamond Street East, Manchester.

Meridian Patent Arc Lamp.

The patentees and sole makers of the photographic lamp illustrated in fig. 2—the Crathorne & Green Manufacturing Co., Wagner Street, Old Kent Road, S.E.—have designed it especially for economy in consumption and rapidity in operation; it is suitable for process work, blue printing, printing from negatives, &c., and is made in two standard sizes, both about 32 in. long over all. It is stated that the internal construction is extremely simple, and

Fig. 2.—Meridian Photographic Arc Lamp.

the improved method of holding the globe, which has no bottom plate, enables the trimming of the carbons and the cleaning of the globe to be carried out with the greatest facility.

The frame carrying the negative carbon is not connected with the circuit, so that there is no tendency for the arc to strike on the frame; the latter also is made very narrow in section, so as to avoid obstruction of the light.

Regulating Transformer.

We show in fig. 3 a variable voltage or regulating transformer, suitable for incandescent lamp testing, medico-cautery work, and for purposes wherever a wide range of voltage is required. In actual practice, transformers of this description have been supplied having a range of volts from 400 to 5, in steps of 20, 10 and 5 volts, capable of delivering 20 amperes at any pressure. The illustration is taken from a photograph of a cautery transformer having a range of 0—10 volts on the secondary side, and 104 volts

Fig. 3.—Foster Regulating Transformer.

on the primary side at 50 periodicity. The switch being directly attached to the transformer, which is of the Foster fire-proof construction, gives a neat compact appearance to the apparatus. The transformer is manufactured at the Wimbledon works of the Foster Arc Lamp and Engineering Co., Ltd., who also supply the coils to switch manufacturers and the trade generally for auto-starters.

Woven-Wire Rheostats.

Realising the inconvenience and deficiencies of spiral wir resistances for use in connection with kinematograph and projectio apparatus, Mr. R. W. Paul, of New Southgate, N., has brought ou the rheostat illustrated in fig. 4. In this the resistance wire woven with asbestos thread into strong nets, which cannot shor circuit or become entangled, and which expose a large and effectiv

cooling surface. The rheostat is incombustible, light and portable, and is enclosed in a strong wire cage with a hinged lid. In the 50-ampere size there are five nets, which are successively coupled in parallel to increase the current; each net allows 10 amperes to pass at a given voltage, and the three-way switch shown in fig. 5 suffices to give all combinations from 10 to 50 amperes. The switch being connected to the rheostat by a 6-core cable, the rheostat may be placed at any distance from the projector.

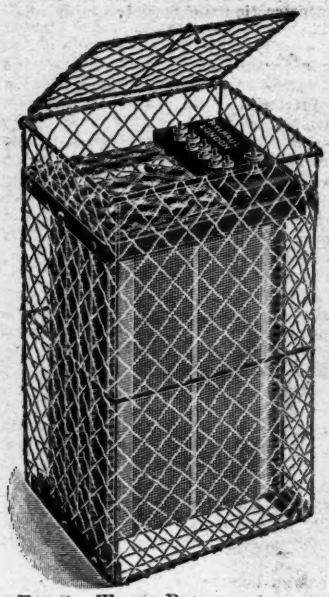


Fig. 4.—Woven Resistance for Projector Work.

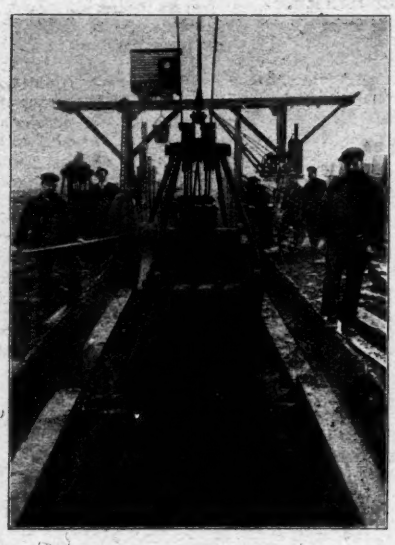


Fig. 6.—Priestman High-Purchase Grab Working in Trench.

Fig. 7.—Electrically-driven Gantry for Working with Priestman Grab.

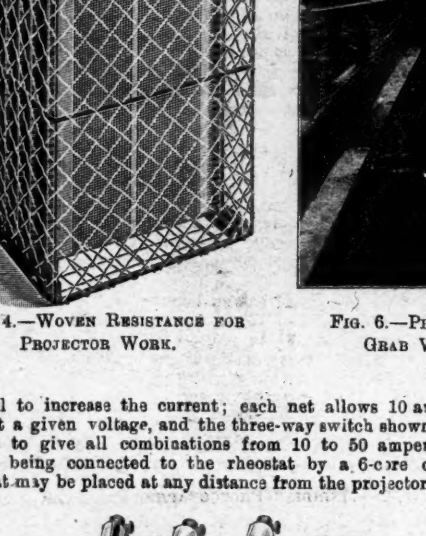


Fig. 5.—Switch for Regulating Woven Resistance.

Similar rheostats are made for single arc lamps, motors, radiators, &c., in simple and cheap forms, which are described in a leaflet (B4) recently issued by the makers.

These resistances have been approved by the L.C.C. Fire Department for use in theatres, &c.

New Cable Suspender.

Messrs. W. T. Henley's Telegraph Works Co., Ltd., of Blomfield Street, E.C., are supplying a new cable suspender constructed in one piece, which can be attached to the cable or bearer-wire first as convenient. These suspenders, shown in fig. 8, are manufactured of the very best materials obtainable. The hook, which is composed of well-galvanised or tinned iron wire of No. 8 S.W.G., is of special design, taking the form of a double hook; and although the attachment to the bearer-wire is very easily accomplished, it is impossible for the suspender to become detached accidentally. The strap is composed of best quality, specially prepared raw hide or zinc, with a brass eyelet to one end of which the hook is fixed, and to the other end an open ring (or loop) of galvanised or tinned iron wire is riveted. In attaching the cable, the strap is passed round the cable, and the loop is then brought up to the lower half of the hook, which is passed through the opening in the loop; the loop is then slipped over the strap.

Prices and particulars of the advantages claimed over other types are set forth in an illustrated circular recently issued by the makers.

An Electrically-Operated Grab.

Recently we referred at some length to the convenience which attaches to the use of electricity in connection with the carrying out of large dock or reservoir contracts. Our illustrations, figs. 6 and 7, show a travelling gantry and Priestman grab used in a contract of this description; the gantry spans a puddle-trench, travelling on track-rails laid on either side, and dumps the spoil on the banks for removal.

In this instance all the motions of the gantry are electrically operated by means of three 220-volt motors with liquid controllers. A supply of energy is conveniently obtained from bare overhead feeder wires, roughly and cheaply constructed, running parallel with the trench; a loose length of cable, connected to the gantry at one end, being hooked over and sliding along the feeders in accordance with the movements of the gantry.

The particular grab illustrated—one of Priestman Bros.' high-purchase type—is used for top stripping in clay, and has a capacity of about 35 cb. ft. It weighs some 35 cwt. empty, and is 4 ft. wide open. Messrs. Priestman have similarly supplied a 25 cb. ft. grab for dealing with sand and shingle. This is some 3 ft. wide and works between the timbering of the trench.

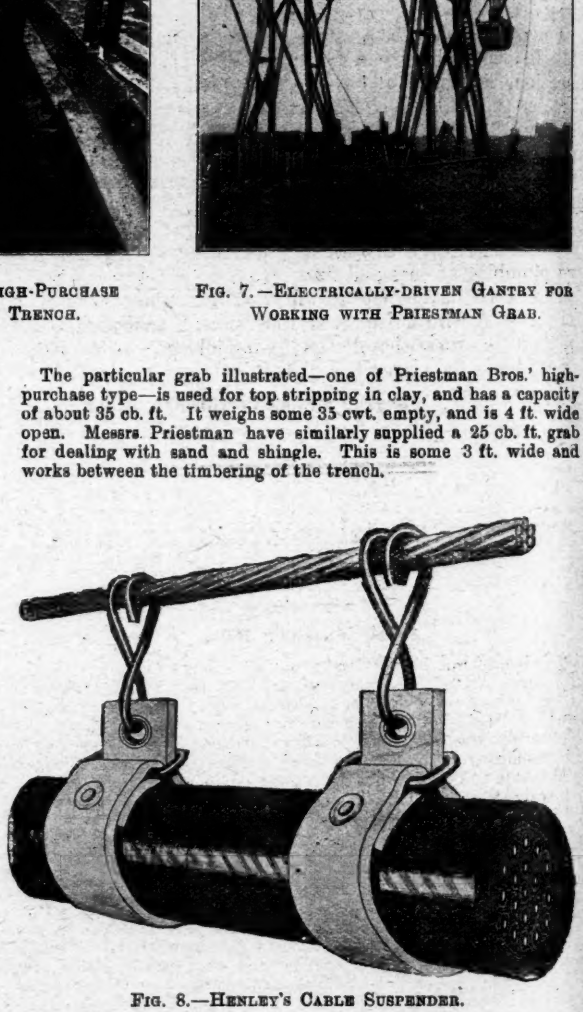


Fig. 8.—Henley's Cable Suspender.

Electrically-operated grabs of this type, especially for removing stiff material such as clay, represent an enormous advance on hand labour, and are immensely more convenient than steam-driven machines in cases where a supply of electrical energy is readily available.

Bedford Lighting.—The Electric Lighting Committee presented to the T.C. on March 24th the accounts of the electric light department for the year ending March 31st, 1909, and the estimates for the ensuing year. The past year just closing would show a gross earning of £7,154, but repayment of loans and interest left a net loss of £174. Asked for an explanation, the chairman of the Committee stated that the introduction of the new lamps had resulted in a considerable reduction of the energy consumed by many large customers, but there had recently been an increase in the demand of 10,000 units, so that, after all, there would be no loss. The estimates for the approaching year showed an estimated gross profit of £8,264, of which £7,969 would go to epay loans and interest, and £295 go to reserve fund. At the same meeting it was decided to erect a refuse destructor, at a cost of £14,000.

ELECTRIC TIME SERVICE.

In spite of the protests which are made from time to time against the public lying-clock nuisance, little is done; a nation of practical people, such as we claim to be, ought surely to rid itself of this disgrace, and raise itself to the level of foreign cities, where "the right time" is supplied by the public authorities. The Post Office authorities ought to utilise their magnificent network of wiring for synchronising purposes, as is commonly done in other countries. They do now offer in London a service consisting of a daily time signal at 6 guineas per annum, the customer to provide his own instruments; but for 35 years a private company in London has dispensed *hourly* Greenwich time signals at half the price, providing the instruments, and lines devoted solely to this purpose. It is easy to demonstrate that the earning capacity of a line devoted to synchronisation alone is insufficient to attract capital, and that ultimately the service is bound to be in the hands of the Post Office, they being the owners of the only complete network of wire available for the purpose throughout the country. It is something to know that they have made a beginning. The Chancellor of the Exchequer might now promote a Bill for the compulsory synchronisation of public clocks, for the benefit not only of the man in the street, but also of the revenue.

However, although synchronisation makes but slow progress, there is another means of securing uniform time-keeping, which is frequently confused with it, but is really quite different, and which is making headway, thanks largely to the pioneering work of Mr. F. Hope-Jones, M.I.E.E., whose "Synchronome" system of electric impulse dials has been described in these columns.

These dials are usually grouped in series circuits in individual buildings, or in groups of buildings forming one institution or one firm's premises. Owing to the prejudice aroused by early failures, we are much behind other nations in our appreciation and use of electric clocks, but much progress has been made in the last few years, and there cannot be far short of a thousand installations now dispensing uniform time in our large factories, offices, hotels, colleges, institutions and public buildings.

A noteworthy example of such an electric time circuit, and one which serves a larger area than any yet installed in this country, has just been completed by the Synchronome Co. at the new Children's Infirmary, Carshalton, to the order of the Metropolitan Asylums Board. The conditions are analogous to those of a large village or a section of a town, as the institution consists of 40 separate buildings spread over an area of 100 acres; an average of three or four clocks in each building was deemed to be the smallest number possible in an institution whose smooth working was so dependent upon punctuality, and consequently 140 electric dials have been installed, mostly of 12-in. diameter. They are served by a single line, which, taking the shortest possible route, is nearly four miles long, and the whole circuit is operated by one master clock; the latter is placed in the Entrance Hall of the Administrative buildings, and consists of little more than a pendulum combined with a switch. It is entirely automatic, cannot stop in closed circuit, and gives ample warning of impending failure of the battery long before such failure causes any irregularity. As an indication of the small amount of electrical energy required, it may be mentioned that the whole battery, guaranteed by the makers for three years, costs less than £5.

As compared with synchronisation or the mere correction of key-wound clocks, the earning power of the line is vastly increased in two ways; first, because the impulses are sent out every half-minute instead of every hour, and are used to directly propel their hands; and secondly, because so many more of them are served by any given mile of wire.

It is, therefore, to such systems of electrical impulse dials intelligently handled by the electrical trade that we must look for any immediate improvement in our time-keeping methods. There is no necessary antagonism between them and synchronisation; the one is for the larger employer, the institution, or the municipal authority, while it is the function of the State to provide the other. When they perform this duty, and at a reasonable price, no proprietor of any electric time circuit will refuse to pay for coupling up his controlling pendulum to Greenwich Observatory, the advantage gained being in direct proportion to the number of dials controlled by it.

PARLIAMENTARY.

County of Durham Electric Power Supply.

This Bill came before the Select Committee of the House of Lords, presided over by Lord Newton, on Friday last. Mr. Vesey Knox and Mr. Maccassey represented the promoters, and Mr. Holman Gregory appeared for the Easington R.D.C.

Mr. Vesey Knox said that the object of the Bill was to allow the Newcastle-upon-Tyne Electric Supply Co., Ltd., the Cleveland and Durham Electric Power Co., Ltd., and the Northern Counties Electricity Supply Co., Ltd., to connect-up their systems for their mutual assistance. These companies supplied 25 per cent. of the total electricity sold in England, and on the Tyneside 95 per cent. of the power used was supplied by the companies. The current was also used for hauling up coal at the coal-pits, and no less than 14 million tons of coal were hauled up by the Durham County Co. alone last year. The rate charged by the companies was so low that it was actually below the amount charged at Niagara. To some extent the connecting-up had already been authorised. In 1906 the Newcastle and the Durham companies were granted powers to link up. Such connecting-up was for the benefit of the public. As to the opposition to the Bill, most of it was due to misapprehension, and there now only remained the Easington R.D.C., who asked that the promoters should give them a supply. They, however, could not do that, as they were a bulk-supply company. The opponents ought to go to the Houghton-le-Spring Co., who were the undertakers in the area in which the Easington district was situated. The petitioners also asked for further protection, but counsel contended that the petition failed under two heads—first, because they were complaining of past legislation, and further, that they were asking for more than the general law, and therefore he asked that they should not be heard.

Mr. Holman, replying to Mr. Knox, in addressing the Committee, said that when the Power Bills were first passed by Parliament 10 or 12 years ago, it was said that the villages and townships would be greatly benefited, as they would be able to get a cheap supply. Although two companies in 1900 and 1901 were authorised to pass through the Easington rural district, the Council had not derived any benefit at all. It was true the company had laid a line down to a coalfield in his Council's area. They had also to complain of the way in which the company had reinstated some of the roads they had broken up, and therefore the Council came to Parliament and asked for protection. The general law was no protection to them, as it did not apply to power companies.

The Chairman said that the Committee allowed the Council a *locus standi*. He understood that counsel's objection was that whilst the larger places would be benefited the smaller towns got no advantage.

Mr. Gregory said that was his position.

Mr. McClellan, of Messrs. Merz & McClellan, formally proved the preamble of the Bill, and it was passed.

Clauses were afterwards adjusted so as to give protection to the Easington R.D.C.

Wallasey Tramways and Improvements Bill.—The Select Committee of the House of Commons, of which Mr. Russell Rea is chairman, considered the Bill promoted by the U.D.C., on March 24th. Mr. H. Lloyd, K.C., appeared for the promoters, and Mr. Ram, K.C., represented the New Brighton Pier Co., petitioners against the measure. The Bill asked for powers with reference to the construction of tramways, and as to these there was no opposition. The estimates for the construction of tramways were £41,483, and for the provision of posts and standards £10,627. The Committee passed the preamble of the Bill.

Second Reading.—In the House of Commons on March 24th, the Baker Street and Waterloo Railway Bill was read a second time.

Torquay and Paignton Tramways Bill.—The Standing Orders Committee of the House of Commons has decided that standing orders may be dispensed with in the case of the above Bill, and the Bill has been allowed to proceed on condition that Tramway No. 2 is struck out.

LEGAL.

The Electro-Peat Coal Co.

(*Concluded from page* 510.)

As we went to press last week we were just able to make the mere announcement of the Judge's finding in this case. The following is a report of what occurred on Thursday:—

Sir E. Carson asked for judgment for Lord Mayo on the findings of the jury. He said that no doubt similar applications would be made on behalf of the other defendants, except Mr. Darlington Simpson. The jury had found that the defendants, other than Simpson, did not issue the draft prospectus of January 20th, 1904, and did not authorise the document to be shown to the underwriters. On the next question, whether the statements were untrue to the knowledge of the defendants, the jury found only against Simpson on that matter. The jury also found that plaintiff was induced by these misrepresentations to take shares in the company. With regard to the second prospectus of April, they found that it contained untrue statements, and untrue to the knowledge of Simpson; that the defendants had not reasonable grounds for believing the statements to be true, but that the plaintiff was not thereby induced to take shares. Therefore, as regarded the second prospectus, no question could arise with regard to Lord Mayo. With regard to the question under the Directors' Liability Act of 1900, whether the defendants or any of them fraudulently concealed from the plaintiff the real facts, the jury found that the facts were concealed, but not with fraudulent intention; therefore, that was out of the question. The jury next found that the plaintiff did not know the real facts on or before April 29th. They also found that there was no evidence to show that Mr. Scoones's report, printed in the prospectus, was a fair and correct one. That question did not arise after the other answers, therefore judgment should be entered for Lord Mayo.

Counsel for Sir L. Falkiner, Mr. Howard Allen, Col. St. Quintin and Mr. Macgregor, the other directors, also asked for judgment in their favour.

Mr. Darlington Simpson, appearing in person, said he wished to argue that the action against him had been abated.

His Lordship said he had nothing to do with that.

Mr. Simpson further contended that the findings of the jury were against the weight of evidence, and asked for judgment in his favour. He added that there was no evidence to show that he authorised the issue of the first prospectus to the plaintiff. Plaintiff said he got it from Mr. Bowden, and there was no evidence to show that he (Simpson) was connected with Bowden in any way.

Mr. Gore Browne, K.C., for the plaintiff, asked for judgment against Mr. Simpson for £910, that being the amount plaintiff had lost on the shares subscribed. With regard to the other defendants, he thought plaintiff was entitled to judgment against them on the finding of the jury that the facts were concealed from the plaintiff, but not with fraudulent intent. That was with regard to the statement in the statutory reports that over 40,000 shares had been allotted. Plaintiff said there had been no proper allotment of 40,000 shares, and that the directors had their attention called to that fact by Mr. Fox, the solicitor, and found it to be true. Therefore, the jury had found that the defendants concealed facts from the shareholders with a view to induce them to remain in the company and not take proceedings.

His Lordship said the jury had found that there was concealment, but not with fraudulent intent. He, therefore, gave judgment for the plaintiff against Mr. Darlington Simpson for £910 and costs. Judgment would be in favour of the other defendants.

Mr. Simpson asked for a stay of execution, which was declined. He next asked for leave to appeal.

His Lordship said leave was not necessary.

His Lordship remarked that all the solicitors had agreed to give the jury special remuneration, owing to the length of the case, but he was sorry to learn that one of the solicitors had withdrawn from the undertaking. He would look into the matter and see what could be done.

Judgment was then entered for plaintiff against Simpson for £910 and costs, and for the other defendants with costs.

Motor-driven Lathes Discussed in the High Court.

An interesting case, involving the application of alternating-current motors to lathe driving, commenced on March 23rd in the King's Bench Division, before Mr. Justice Pickford.

The C. & T. T. Pattison Societa Anonima, of Naples, sued Messrs. John Birch & Co., London Wall, E.C., machinery merchants, for damages in respect of breach of contract in supplying certain electrically-driven lathes; the latter were of Messrs. Dean, Smith and Grace's manufacture, and this firm were cited as third parties.

Mr. Scrutton, K.C., represented plaintiffs; Mr. Harrison, K.C., was for the defendants, Messrs. Birch; and Mr. Bousfield, K.C, represented Messrs. Dean, Smith & Grace.

Mr. Scrutton, for the plaintiffs, said that the lathes were constructed for use with high-speed steel tools, which plaintiffs were introducing into their works with a view to dealing with forgings which had previously been machined by outside firms. Defendants entered into a contract in 1904 to supply three lathes (16 in., 12 in. and 10 in. centres), direct coupled to Westinghouse motors, and warranted to be capable of running at a uniform range of speeds suitable for all classes of work; the price was £1,272 10s. 8d. Plaintiffs declared that the machines did not comply with the requirements, and that they could not be worked at a sufficiently low rate of speed for general shop-work. Defendants denied the warranty, stating that the onus rested on the makers of the machines.

Mr. Henry Pattison, of the plaintiff firm, corroborated the above statement, putting in tables showing tests of the lathes. He said that the motors supplied were really constant-speed motors, which were a cheaper type; it was only possible to run the motors on full load at different speeds by putting in resistances, and that was very uneconomical. His firm had obtained quotations from the Oerlikon Co. for motors with rheostats, to obtain speed variation, but with these the power fell with the speed, and his firm wanted full torque at low speeds, and expected that defendants would have understood that. The Oerlikon Co.'s motor, which they had considered, was a three-phase variable-speed induction motor, giving 30 h.p. at the highest speed, but it was a much more expensive machine than the type fitted. These were the first electrically-driven tools installed, but their plant was all driven electrically now. It was possible to obtain speed-variation by driving through speed-gearing, but it was an undesirable complication and resulted in loss of power. Witness admitted that the Westinghouse Co. had offered to supply resistances and another control for the motors, but they would not guarantee that these would give the speeds required.

In reply to Mr Harrison, Witness admitted asking for quotations for alternating-current induction motors direct-coupled to each machine, and did not see why the speed variation should not be obtained through the speed cones. They left it to the makers to supply the best type of motor for the purpose.

Mr. Monkhouse (of Burstall & Monkhouse) having given evidence in corroboration of the above,

Mr. Harrison, for defendants, discussed the question of the warranty, which he contended was wrongly construed by plaintiffs. Plaintiffs selected the kind of lathe, and gave instructions to defendants to order the same from Dean, Smith & Grace. If defendants had any obligations, it was as to damages, and as to this he proposed to call evidence.

Mr. Percy Good, consulting electrical engineer, gave evidence for defendants, showing that the trouble with the motor-drive could be obviated by inserting speed gears, at a cost of about £120 for the three lathes; this would lead to a waste of about 10 per cent. in power.

Cross-examined, Witness thought the necessary speed variation could be obtained by inserting two cone pullies; most modern big electrically-driven lathes were geared to the motor, which ran at a constant speed.

Mr. Walter H. Bell and Mr. W. A. Smith (Smith & Croft) also gave evidence, the latter agreeing that it was questionable whether an 800 r.p.m. alternating motor would run under resistance at 280 r.p.m.; the power would diminish to nothing with reduced speed, and he would not recommend such a method when gearing could be used.

After Mr. Harry Smith (of Dean, Smith & Grace) had given evidence as to the efficiency of the lathes,

Mr. Bousfield addressed his Lordship with a view to showing that the lathes and motors when supplied were up-to-date; he agreed that the gear-drive would be a more practical method, but it would be more complicated and would cost more.

Mr. Harrison, for Messrs. Birch, urged that plaintiffs had kept the lathes and ought to have taken steps to put them in order within reasonable time. They had no right to allow the damages to mount up through three or four years, and could not claim damages without submitting figures, &c., in proof of their claim. He submitted that plaintiffs, if they had made out a breach of warranty, were only entitled to £120 for fitting the gearing.

In giving judgment, his Lordship said that having read the correspondence and documents forming the contract, it was not disputed that the description with regard to uniform speed suitable for all classes of work and the particular speeds mentioned should give the results, but it was said that that only applied to belt-driven lathes and the application of a motor altered matters, and that there was no warranty as to the motor. He thought the meaning of the contract was "we will give you a lathe which will give you uniform speeds suitable for all classses of work, and which will give substantially the speed mentioned." It was admitted that plaintiffs did not get the machines wanted, so that the only question was as to damages. It was not disputed that these lathes and motors could be made to work satisfactorily with intermediate gearing at a cost of about £120, and it was singular that this method was never mentioned between the parties. He was of opinion that the lathes could have been made to satisfy the terms of the contract in 1904 at a cost of about £150, and he awarded plaintiffs that sum; for loss of the use of the machines he awarded another £150, making £300 in all. Defendants would have to pay the costs of the action.

Mr. Harrison and Mr. Bousfield then proceeded to argue the case as between Messrs. Birch and the third parties, Messrs. Dean, Smith & Grace, and his Lordship held the view that the third parties were under the same obligation to Messrs. Birch as the latter were to plaintiffs; Messrs. Birch were, therefore, entitled to be indemnified by the third parties, and he gave judgment against the latter for £300 damages and costs, also the costs of defending the action brought by plaintiffs against Messrs. Birch, including costs payable by that firm to plaintiffs.

Redgrave *v.* London United Tramways, Ltd.

In this action, tried before Mr. Justice Sutton and a special jury in the King's Bench Division last week, the plaintiff, Emma Redgrave, a domestic servant, was awarded £296—£250 as general, and £46 as special damages—for personal injuries resulting from an accident. The plaintiff's case was that in the company of her brother she travelled on the outside of one of the defendant company's electric cars on a Sunday in August last, and when at Shepherd's Bush Green, opposite a compulsory stopping place, she attempted to alight, the car having stopped. While stepping from the footboard, however, the car started, throwing her into the road, fracturing the bone of the right arm below the elbow. The case for the company was that the accident arose through the plaintiff attempting to leave the car while it was in motion, but the jury found in her favour, and judgment was entered for the amount stated.

Wycombe Borough E.L. & P. Co., Ltd., *v.* R. A. Merton.

In the King's Bench Division on March 25th and 27th, Mr. Justice Hamilton heard an action brought by plaintiffs against defendant, of Temple End, High Wycombe, to recover damages alleged to have been sustained by defendant's repudiation of a contract contained in correspondence dated January 9th and 16th, 1908. Defendant denied the existence of any contract, and in the alternative, that the contract, if any, was cancelled by mutual agreement.

Mr. Charles Stimson appeared for plaintiffs, and Mr. Cecil Walsh was counsel for defendant.

Plaintiffs' case was that as the result of an interview between Mr. John Cuthbert Wigham, a director of the plaintiff company, and the defendant, a contract was entered into between the plaintiffs and defendant, whereby the plaintiffs were to supply and fix on foundations to be provided by defendant in premises situated in Hughenden Road, Chipping Wycombe, an electric motor of 40 h.p., running at about 650 r.p.m., fitted with the necessary starting switches, fuses and wires. The cash price was to be £138 net, and

upon installation defendant was to hire the motor for one year, at £6 1s. per year, the plaintiffs maintaining and keeping it in order. It was further agreed that at the end of the first year the defendant was to have the option of continuing to hire the motor at the same rental for another year, or for five years at £5 13s. 4d. per year. It was also agreed that plaintiffs should supply the current upon terms arranged. On February 14th defendant wrote wrongfully putting an end to the agreement, stating that he had decided to put in suction gas plant.

Defendant denied the contract, asserting that the interviews and correspondence never proceeded beyond the stage of negotiations. Alternatively, he said the agreement was waived by the plaintiffs requiring him to enter into a further agreement, which contained terms outside those arranged; he also declared that the agreement was rescinded verbally by mutual consent at an interview which he had with plaintiffs' manager.

His Lordship, in giving judgment, said the action was brought for breach of an agreement, by which the plaintiffs were to install an electric motor on defendant's premises and let him have it upon hire, with an option to purchase upon hire-purchase terms. He had, however, come to the conclusion that no agreement was entered into at all, and he gave judgment for the defendant with costs.

Engineering Instruments Ltd.—Reduction of Capital.

In the Chancery Division on March 27th, Mr. Justice Swinfen Eady had before him the petition of this company for reduction of its capital. Mr. Micklem, K.C., appeared in support of the petition, and said there had been a loss of £19,582 in carrying on the business. Part of that sum was represented by directors' fees which had not been paid, and which they proposed to release, and the company asked the Court to write off £18,437, representing losses which had been incurred. The company was incorporated in June, 1900, with a capital of £50,000, divided into ordinary and deferred shares. It was formed principally for the purpose of selling electricity meters, which turned out to be defective in consequence of some flaw. After working for a year or two defects were found in the meters, and the company had to withdraw them, give up the manufacture of meters, and proceed with the business of electrical engineers only. That business had been carried on for three years and there had been a loss, but during the last year or two the business had improved, and it was the wish of the shareholders, the creditors and the debenture-holders, that the company should be continued, and that could only be done under an arrangement sanctioned by the Court, authorising the writing off of the lost capital. He therefore asked the Court to sanction certain special resolutions which had been passed by the company, altering the rights of the deferred shareholders, and giving the ordinary shareholders preference in case of winding-up.

Answering his Lordship, Mr. Micklem said a large number of meters were manufactured, but many had been returned and others were obsolete; others had been rendered useless owing to some flaw. There was ample provision made for creating any additional capital that might be required.

Mr. Justice Swinfen Eady sanctioned the proposed reduction.

"Z" Electric Lamp Manufacturing Co., Ltd., *v.* Zossenheim.

We are informed that this matter was before the Courts again last Friday, when Mr. Justice Parker made an order for an interlocutory injunction, in accordance with plaintiffs' motion.

London Fires in 1908.—According to the annual report of the London Fire Brigade just issued, of the 3,238 fires which occurred during 1908, 101 had their origin in electric lighting, &c., as against 355 which were directly attributable to gas lighting and heating. The fires in connection with electric lighting were caused as follows: Defective electric circuit, 91; electric fan forcing air into an airship, 1; electric lamp coming into contact with goods, 1; electric light coming into contact with celluloid goods, 1; electric spark coming into contact with mineral oil, 1; electric spark coming into contact with vapour of spirit, 1; defective electric wires, 1; friction of electric fan, 1; short circuit, 1; spark from carbon, 1; spark from electric arc lamp, 1. The details of the gas fires were as follows: Escapes of gas, 108; curtains, &c., coming into contact with gas light, 84; portable gas stoves, 23; overheating of gas stoves, 22; swinging gas brackets, 22; gas stoves, 20; seeking with light for gas escape, 15; overheat of gas light, 14; curtains, &c., coming into contact with gas stove, 11; gas fitters at work, 8; clothes coming into contact with gas stove, 7; goods coming into contact with gas light, 6; overheating of gas engine, 4; gas light, 4; gas ring, 2; gas lighting, 2; portable gas copper, 1; gas lamp, 1; spirit coming into contact with gas light, 1. There were seven fires at electric light works, and nine outbreaks of fire on electric tramcars on the road, all being caused by defective circuits. There were seven fires on the premises of electrical engineers, six being caused by defective circuits and one by defective wires. There were four fires at gas works, two being caused by lights thrown down, one by an escape of gas, and one by a spark from a workman's tool.

THE ELECTRICAL TRADES BENEVOLENT INSTITUTION.

Festival Dinner.

On Tuesday last the first Festival Dinner of the Institution took place at the Hotel Metropole; the function proved highly successful in every respect, and may be regarded for the future as an annual event. Greatly to the regret of the company, Sir W. H. Preece was unable to take the chair, having been obliged to retire to Wales for his health's sake; Prof. Perry also (one of the vice-presidents) was prevented from attending the dinner. Most fortunately, however, Mr. W. M. Mordey consented to preside, thus dispelling any possible impression that there might be a lack of harmony between the Institution of Electrical Engineers—which has a benevolent fund of its own—and the Electrical Trades Benevolent Institution.

The toast list, like the speeches, was commendably brief, and the intervals were pleasantly occupied by an excellent entertainment, the programme including Miss Mabel Braine, Mr. R. E. Miles, Dr. Byrd-Page, Mr. Jock McCallum and Mr. T. E. Gatehouse, accompanied by Mr. C. Bassett.

Naturally the speeches were all more or less animated with the same motive—the desirability of providing assistance for those who have fallen on hard times. The President, after making a feeling reference to the absence of Sir W. H. Preece—"the father of the electrical industry"—and sending him a telegram expressing the good wishes of the company for his speedy recovery, explained that the main object of the Institution was to help those who had fallen in the great race; not only those whose misfortunes were due to no fault of their own, but also those who might not be altogether free from blame in this respect. The benefits of the Institution were not to be extended to workmen, who had ways of their own of providing for their needs, but were particularly intended for those who occupied positions in the electrical industry intermediate between the masters and the workmen, and were unable to make use of the methods of organisation open to the latter. Local associations would be formed to assist the work of the Institution in places which could not be reached from London.

The origin of the Institution was the surplus from the Electrical Exhibition at Olympia a few years ago. The funds now amounted to £1,650, and the work of granting relief had already commenced. Pensions could not be granted until the Institution had been at work for some years and had accumulated sufficient funds for the purpose; they would only be awarded to those who had subscribed to the funds for at least five years, and as the Institution grew, the idea of granting relief first to those who had themselves contributed to the funds would be encouraged.

In addition to the £1,650 in hand, at least £350 was expected to be received from the Manchester Electrical Exhibition, and in 1911 there would be a further sum of £350 from the Olympia Exhibition, so that £2,350 was in sight, a very good and substantial beginning. The Institution of Electrical Engineers had a similar fund, confined to its own members; he hoped that, in the future, some sort of co-operation between the two funds might be devised, and in conclusion, Mr. Mordey commended to his audience the special object of the dinner—the duty of supporting the fund—and proposed the health of the Institution.

Mr. R. Kaye Gray, Vice-President, supported the toast, congratulating the Institution on having so soon got together over £2,000; the object of the fund, he said, must appeal to everyone. In the great industry in which they had all been engaged for so many years, many men must have found themselves on the wrong side, and it was pleasing for those who were more fortunate to help their less fortunate fellows. He hoped that each would do his best to promote the success of the Institution.

Mr. J. H. Rosenthal, in place of Prof. Perry, also supported the toast; he remarked that he was much struck with the statement of the President, that the fund was not created for those who were blameless, but for those who had failings, and who, therefore, most needed help. He remembered when the electrical industry practically started, about 25 years ago;

the time had now come when men required help, especially those who were neither masters nor workmen, and he hoped they would all open their purse-strings as fully as they could afford in these hard times.

Mr. G. Burney proposed the health of the President, whose presence on that occasion he regarded as a very great advantage to the fund. No work gave him greater pleasure than his work for the fund as a member of the committee; the fund had now been placed on a permanent and satisfactory basis, and they could go forward with greater hope and good prospects.

The President, by way of reply, announced that the stewards had collected £220 in the room—a very satisfactory result for the first dinner. The total was now £2,591, made up of the following amounts:—

Collected up to the end of 1908	£1,211
„ to date	460
„ at the dinner	220
Total in hand...	£1,891
From Manchester Exhibition surplus, about ...	350
Due in 1911	350
	£2,591

Mr. Mordey then called for hearty cheers for Mr. W. Davenport, Mr. Justus Eck, and Mr. T. E. Gatehouse, in recognition of their efforts on behalf of the Institution, and concluded by expressing his pleasure in filling the office of president, and his hope that the fund would live long and prosper.

We may add that the rest of the Committee, and especially Mr. L. G. Tate, have been most assiduous and untiring in promoting the interests of the fund.

BUSINESS NOTES.

The Electrical Trade of Argentina.—According to the *Elektrotechnische Zeitschrift*, the returns issued in relation to the foreign trade of Argentina show a great development in the imports of electrical manufactures in the course of the present century. The average value of the imports in the four years ended with 1904 was 1,015,000 gold pesos; the value increased to 2,035,000 pesos in 1905, and to 3,430,000 pesos in 1906, but in 1907 there was a slight decline to 3,373,000 pesos.

The share held by Germany in the total value of the imports averaged 41 per cent. in the four years ended with 1904, and it reached 56 per cent. in 1905, 47 per cent. in 1906, and 54 per cent. in 1907. On the other hand, the corresponding figures for Great Britain are 28 per cent., 23 per cent., 33 per cent. and 25 per cent. respectively. These two countries consequently supply three-fourths of the requirements of Argentina, the other participating nations, the United States, Italy, France and Belgium, being very far behind. The principal imports (of the value of over 30,000 gold pesos) were as follows in the years 1906 and 1907, the figures being in gold pesos:—

	1907.	1906.
Cables and conductors (5 per cent. duty)	1,316,000	916,000
Dynamos and motors	454,000	447,000
Cables and conductors (25 per cent. duty)	29,000	394,000
„ „ „ (duty free)	162,000	280,000
Telegraph materials	146,000	56,000
Measuring apparatus	91,000	119,000
Glow lamps	87,000	91,000
Arc lamps	84,000	78,000
Insulators, stoneware and porcelain	68,000	61,000
Telephone materials	48,000	48,000
Carbons	40,000	56,000
Electromobiles	38,000	—
Total	3,373,000	3,430,000

The imports from Germany in 1907 experienced considerable increases over the preceding year in the case of cables and conductors and dynamos and motors, but reductions took place in arc lamp carbons, glow lamps, meters and measuring instruments, and in insulators.

New Nernst Lamp.—We are informed that the Electrical Co., Ltd., of 121-125, Charing Cross Road, W.C., are placing on the market an entirely new high-efficiency lamp, adapted from the Nernst principle, but a considerable improvement on the latter. On a 220-volt circuit, a c.p. of about 30 is obtained, and the consumption is ·2 ampere; the wattage is thus about 44, and the efficiency is 1·4 watts per c.p. The lamp is of small size, and very neat appearance, the four parts of the original Nernst lamp, namely, the body, burner, resistance and globe, being combined, and materially improved; the lamp lights up within approximately 10 seconds after switching on the current, and the makers guarantee for it on d.c. circuits, under normal conditions, an individual life of 400 hours per lamp. The average life is actually about 700 hours, but the makers believe that the British market will be much more ready to accept an individual guarantee upon each lamp, than an average guarantee spread over a number of lamps; they have, therefore, fixed the above number of hours as the minimum life, and agree to replace any lamp which may burn out under this period. The lamp is manufactured for all voltages from 200 to 300 volts, but for the present it is only recommended for use on d.c. circuits. The wattage, 44, compares favourably with other lamps, and the c.p. obtained, 30, is suitable for the average light consumer. Price lists, &c., concerning the lamps, will be dispatched to the trade in a few days, and a stock of lamps has already been received.

Busy Contractors.—Messrs. Shalders & Davis, electrical contractors, of Southampton, report that since the commencement of the year they have been exceedingly busy with new work. They have at present in hand a suction gas plant, engine, dynamo and battery, for Fair Oak Park, Eastleigh; oil engine plant consisting of engine, dynamo, battery and motors, for Camp Hill, Lyndhurst; wiring for about 1,000 lights, and mains at the Hants County Asylum; the whole of the electric light, bells, and other engineering works for the New Sailors' Home, Southampton; complete electric light installation at the Gables, Gosport, &c.

Messrs. Edwards & Armstrong, of Bristol, report having plenty of good work in progress at present. The following are some of the contracts upon which work will be started during the coming month:—

Complete installation, comprising suction gas plant, accumulators, underground mains, &c., for the Tewkesbury Electric Lighting Co.

Complete installation with suction gas, accumulators (1,080 ampere-hours) and wiring for Brislington Private Asylum, provision for 900 lights.

Complete installation with water power plant at Oker House, Shropshire.

Complete installation with oil engine plant for Beachfield, Wiltshire, 400 lights to specification of Mr. Herbert Sully, M.I.E.E., consulting engineer, Bristol.

Bennis Stokers.—From a lengthy list of contracts recently booked by Messrs. E. Bennis & Co., Ltd., for their stokers, &c., for all classes of works, we select the following as coming directly within our province:—

Frederick Smith & Co., Ltd., wire manufacturers, Caledonia Works, Halifax, two stokers and C.A.F. for new 9 ft. diameter Lancashire boiler now being put down.

Kettering Urban District Council Electricity Works, two stokers and C.A.F. for Lancashire boiler.

Leicester Corporation Tramways Station, Belgrave Road, two new Bennis coking stokers and C.A.F. for Lancashire boiler.

Catalogues and Lists.—The Sunbeam Lamp Co., Ltd., Park Road, Gateshead-upon-Tyne.—New 8-page catalogue (Section II) giving illustrations and prices of many examples of their cast-iron water-tight fittings for ceiling, bracket and cluster-form use. Hand lamps are included, also bulkhead or sconce fittings and guards for same.

The "Witton-James" System of Printing Press Control, 71, Queen Victoria Street, E.C.—Illustrated catalogue wherein are contained descriptive particulars and excellent pictures of this system of electric motor printing press driving equipments for multiple push button or single-station control on alternate or continuous-current circuits. A number of views show "Witton" motors and generators, among them being some of a 15,000-kw. (1,500?) 6,600-volt generator, driven by Belliss engine at the Dublin, one of 14-500-kw. motor-generators built for the L.C.C., and so on.

India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd., Silvertown, E.—List No. 32, giving prices of electric bells, bell-pushes, pulls, mounts, indicators, switches, &c.; also a pamphlet containing a reprint of an article by Mr. E. Raymond Barker, on "The Two-tone Vibrating Transmitter and Cable Inductive Signalling."

Messrs. Cowans, Ltd., Springfield Lane, Salford, Manchester.—Two new leaflets No. 36, illustrating and giving prices of oil-circuit breakers for h.t. alternating-current circuits; No. 38 deals similarly with enclosed-type low-tension oil-break circuit breakers.

Messrs. Aron Electricity Meter, Ltd., 80a, Salusbury Road, Kilburn, N.W.—16-page catalogue, in which descriptive particulars with illustrations and lists of prices appear, of Aron electric clocks—self-contained clocks, master and sub clocks, electric signal clocks, &c.

Messrs. S. H. Heywood & Co., Ltd., Reddish.—20-page pamphlet, containing information and many illustrations relating to electric and hand transporters and runways.

Messrs. Bagshawe & Co., Ltd., Dunstable Works, Dunstable.—Section "S" pamphlet, showing and pricing their steel elevator buckets for chain or band conveyors.

Messrs. W. H. Bailey & Co., Ltd., Albion Works, Salford.—Illustrated lists of their "See-saw" float steam trap, the Foster fan engine regulator, and Bailey's reducing valves.

Messrs. Joseph Baker & Sons, Ltd., Willesden Junction, N.W.—Small pamphlet (No. 175) giving particulars of their "Pierson" patent automatic gas producer for power and heating purposes.

Book Notices.—*The Municipal Year Book for* 1909. London: Edward Lloyd, Ltd. 7s. 6d. net. Edited by Robert Donald.—This book is practically indispensable to all who have dealings with, or take a real interest in, municipal undertakings in the United Kingdom. It is not a work lending itself to review, for it is more of a directory than anything else, giving full and general information regarding all matters relating to municipal government, the *personnel* of all the different Corporations, Borough and other Councils, and the undertakings in which they are engaged, among them of course being, in many cases, electric lighting and tramway systems, and gas works. Special sections are devoted to general statistics of tramways and electricity supply systems, with analyses of accounts in these departments. There is a small section relating to motors in municipal service, and others

cover fully such matters as education, refuse and sewage disposal, Old Age Pension Committees, and so forth. To some electrical firms the digest of legal cases may be of occasional use. But these are only a few of the matters which are covered in a very bulky volume, which must be invaluable for reference. We wonder whether it would not be worth while devoting a few additional pages to making the arrangement of the index a little clearer.

Manual of Electrical Undertakings and Directory of Officials. 1909. London: Electrical Press, Ltd. 21s. net.—Garcke's *Manual* has now reached its thirteenth year, and each edition becomes more imposing than its predecessor. At this time of day anything like a review of the volume is hardly necessary, but it will be interesting to mention some of the new and outstanding points. In the course of more than 2,000 pages it sets forth in convenient sections the latest available statistical and other information regarding all electrical undertakings (nearly 3,000) whether municipal or company, and the names of over 11,000 officials, directors and engineers who are employed in the industry. The present edition has been enlarged. This is necessary even in connection with a declining industry if you desire to keep its record up-to-date. Names and addresses of members of lighting and tramways committees are more than doubled, and we understand that the Colonial section has been amplified. A new feature consists of a general survey of the year, and tables of imports and exports for the past five years are included for the first time. There are tabular statistics, many maps, and various other things which electrical men, in whatever department they are engaged, need at hand for reference many times during the course of the year.

Reid's Handy Colliery Guide for Northumberland, Durham and Yorkshire. London and Newcastle: Andrew Reid & Co., Ltd. 2s. 6d.—The title alone is almost enough to indicate the useful character of the contents of this book. At a time when so many of our readers are taking an interest in colliery electrification, lists of colliery-owners, with the situation of their collieries, names of agents, managers and engineers, must be acceptable. The list of the same collieries follows in alphabetical order, as do similar lists of the agents, engineers and fitters. Particulars as to H.M. District Inspectors of Mines, a copy of the Explosive Acts, Coal Mines Regulation Act, and a reprint of the Special Rules for the Installation and Use of Electricity in Mines, are also published. A synopsis of the Workmen's Compensation Act of 1906 and some information of general interest, complete a collection of very useful material on a subject of increasing importance to the electrical trade.

The I.C.S. Student.—We have received the first part of this magazine, which is intended to circulate among the students of the International Correspondence Schools, Kingsway, and to be partly written by them. A portrait of Mr. T. J. Foster, the founder of the schools, is given, followed by an historical sketch and various articles relating to I.C.S. affairs.

"Protection from Power Circuits." By S. C. Bartholomew. Excerpt from the *Proceedings* of the Institution of P.O. Electrical Engineers. London: The Librarian of the Institution. Price 1s. net.

"Hydro-Electric Installations." By E. Kilburn Scott.—Excerpt from the *Journal* of the Royal Society of N.S. Wales, Vol. XLII.

"Transactions of the North-East Coast Institution of Engineers and Shipbuilders." Parts 3 and 4., Vol. XXV. Newcastle-upon-Tyne: Andrew Reid & Co., Ltd.

"The Young Model Maker." Design No. 2. (Lighthouse.) London: Percival Marshall. Price 1s. net.

Journal of the Institution of Municipal Engineers. Vol. I, No. 1. London: The Institution. Price 1s.—This, the first issue of the new body, is well produced, quarto size, on art paper, with a portrait of the President, Mr. J. T. Pegge, for frontispiece. It contains the proceedings at the general meeting held on January 16th, a list of members and students, and other matters.

"Pocket-Book of Electrical Rules and Tables." By J. Munro and A. Jamieson. Nineteenth edition. London: C. Griffin & Co., Ltd. 1909. Price 8s. 6d.

Patent Application.—Application for restoration of patent No. 23,150 of 1903 for "Improvements in apparatus for the production of heat by burning liquid fuel," has been made by Grigory Gordejeff. The patent expired in 1907, owing to non-payment of renewal fee.

Bankruptcy Proceedings. — Arnold Roberts (Roberts Bros.), electrical engineer, 21, North Parade, Bradford. Adjudication order made March 26th. First meeting April 8th, at 12, Duke Street, Bradford. Public examination April 28th, at County Court, Manor Row, Bradford.

Meter Approved.—The Board of Trade has approved of type O meter deposited on July 29th, 1907, by the Bat Meter Co., Ltd., 3, Eden Street, Hampstead Road, N.W.

Trade Announcements.—The Private Wire and Telephone Installation Co., Ltd., have amalgamated with the Electrical Engineering and Maintenance Co., of 49, Lime Street, E.C., and they will now trade under the title of Electrical Contracts and Maintenance Co., Ltd. On March 25th they removed to Sanctuary House, Westminster. Mr. J. L. Newland is managing director of the joint concern.

The Mirrlees Watson Co., of Glasgow, have engaged the services of Mr. W. Minty, late works manager and engineer to the Moss Bay Hematite Iron and Steel Co., Workington. Mr. Minty will devote himself specially to questions of exhaust steam utilisation and condensing in connection with iron and steel works and collieries.

Messrs. Bruce Peebles & Co., Ltd., have removed their Manchester offices from 64, Cross Street, to No. 30, Cross Street, where they have taken more commodious offices. The management of this branch office will remain, as before, in the hands of Mr. J. W. Saaler.

Mr. Lawrence D. Henderson has retired as director from Messrs. David & Wm. Henderson & Co., shipbuilders and engineers, Glasgow, and has joined Messrs. Victor H. Coates & Co., engineers, 2, Norfolk Street, Strand, W.C.

The Davis Electrical Co., Ltd., of Moor Street, W., ask us to state that the agency which they hold from Messrs. John Birch and Sons, of Walsall, for conduits and accessories, has been determined by mutual consent.

Owing to increased business, Messrs. Morris-Hawkins, Ltd., have removed to larger offices at No. 30, St. Mary Axe, E.C.

Messrs. Richardsons, Westgarth & Co., Ltd., have removed from 5, Queen Anne's Gate, to 17, Victoria Street, Westminster, S.W. Their telephone address is unaltered.

The Micanite & Insulators Co., Ltd., have removed into their new works—Empire Works, Blackhorse Lane, Walthamstow, E.—which adjoin the old factory. The new works cover two acres of ground, and are equipped with up-to-date machinery for the manufacture of Micanite specialities and other insulating products.

Messrs. Anderson & Munro have taken more central offices at Randolf Place, Edinburgh, also a workshop in the vicinity.

Messrs. Birch & Vertue have commenced business as electricians, at 38, Union Street, Aldershot.

Liquidations.—The creditors and shareholders of the Bartitsu Light Cure Institute, Ltd., 29, Bedford Row, W.C., met on Tuesday at the Carey Street offices of the Board of Trade, Lincoln's Inn, W.C., to elect a liquidator to act under the compulsory winding up order recently made against the company. The chairman reported that accounts had been lodged showing liabilities £3,260, against assets £2,004, and a deficiency of £21,794, as regards contributories. The company was promoted in March, 1906, to take over and develop as a going concern the business of the Bartitsu Light Cure and Electro-Therapeutic Institute, carried on by Mr. E. W. Barton-Wright. The nominal capital was originally fixed at £10,000, but was increased in June, 1906 to £22,500. The company originally had registered offices at 67B, Shaftesbury Avenue, but they were removed in November, 1906, to Bedford Row. The company also carried on business at 1, Albemarle Street, Piccadilly. Under the purchase contract the company acquired from Mr. Barton-Wright for £9,000, payable as to £1,500 cash, and £7,500 shares, the goodwill and assets of the Institute, together with an agreement for the lease of the Albemarle Street premises. A prospectus was publicly issued in March, 1906, inviting subscriptions for 2,500 preference shares, but only about £150 was subscribed, and being below the minimum subscription fixed by the articles of association, the money was returned. The company traded at a loss throughout, and in January last Mr. Alfred Ellerton, chartered accountant, was appointed receiver and manager on the debenture-holders' behalf. The failure was attributed to lack of funds consequent on litigation. The case was left in the hands of the Official Receiver.

Irish Compressed Peat Fuel Co., Ltd.—A meeting is to be held at 64, Outer Temple, W.C., on April 27th, to hear an account of the winding up from the liquidator, Mr. W. B. Martin.

Messrs. J. Defries & Sons, Ltd.—This company, of 147, Houndsditch, is winding up voluntarily, with Mr. A. F. Whinney, 32, Old Jewry, E.C., as liquidator, as it cannot, by reason of its liabilities, continue its business.

Sevenoaks Motor-Car and Electrical Co., Ltd.—A meeting is to be held at London Road, Sevenoaks, on May 6th, to hear an account of the winding up from the liquidator, Mr. A. P. Guerrier.

Electro-Medical Institute, Ltd., Bury New Road, Salford.—First meetings of creditors and contributories, April 8th, at Byrom Street, Manchester.

Fire-proof Cable.—We have received from the Armorduct Manufacturing Co., Ltd., Farringdon Avenue, E.C., a sample of ordinary vulcanised rubber cable treated by a special fire-proofing process which has been devised at their works. Testing it in a flame, we find that in spite of the highly inflammable nature of the rubber, it is difficult to set the cable alight, and on removing the flame the cable ceases burning. We are informed that cables so treated cost but little more than ordinary cables.

LIGHTING and POWER NOTES.

Acton.—The Council has held a special meeting to consider the question of handing over the local electricity undertaking to the Metropolitan Electric Supply Co. for a term of 37 years. The company had stated that the matter of prices to be charged must be settled by the local conditions, but it was proposed to supply municipal buildings at 4d. per unit; the company was also willing to submit to arbitration in the case of disagreement on the capital expenditure. The company was unable owing to statutory limitations to purchase the concern outright. In the discussion, Mr. J. M. Blair, the Council's engineer, pointed out that the Council could erect its own generating station for £20,000-£25,000; other speakers took an optimistic view of the future, pointing out that in some three

years they could terminate the present agreement and generate their own energy. The chairman said he did not think the majority of the Council desired to part with the undertaking, and the voting on the resolution being equal, he declared the same not carried. A special sub-Committee was subsequently appointed to negotiate further with the company with a view to obtaining better terms.

Australia.—A movement is on foot in the Melbourne suburbs, bordering on the Yarra River, to utilise the water power of the river for the generating of electricity. It is proposed to obtain a Government report on the feasibility of carrying out a scheme; the Minister of Water Supply is expected to call a conference on the subject.

In connection with the proposed Melbourne Suburban Railway electrification scheme, Mr. Merz has replied to the report of the Commissioners, maintaining his former position.

Bexhill.—The T.C. has decided to apply to the L.G.B. for a loan of £2,120 for a new condenser and cooling tower, tenders for which have been accepted (see "Contracts Closed").

Bridlington.—The T.C. has applied to the L.G.B. for a loan of £700 for a new boiler, &c., at the electricity works.

Cheshunt.—The B. of T. has revoked the 1906 prov. order.

Continental Notes.—BELGIUM.—The central electricity station of the Societe Bruxelloise d'Electricite at Schaerbeck, near Brussels, is now complete. The plant comprises two 1,500-KW. steam turbines coupled to 6,000-volt, 25-cycle three-phase alternators, an 11,000-volt, 50-cycle set, and two 2,000-KW. turbines and alternators. Among the contracts for the supply of energy is one for all the stations of the Belgian State Railways in the Brussels district.

RUSSIA.—After long negotiations the municipal authorities of Odessa have granted a concession to a syndicate for the establishment and working of a central electricity generating station in the city. The Gesellschaft fur Elektrische Unternahmungen, of Berlin, the Societe Generale Belge d'Entreprises Electriques, of Brussels, and the Societe Financiere de Transports et d'Entreprises Industrielles are stated to be interested in the scheme.

AUSTRIA.—An important addition has just been made to the plant of the Bregenzer Electricitätswerke, of Bregenz. The new station, which utilises certain available water power, has a capacity of no less than 10,000 H.P.; the plant comprises four 2,500-H.P. turbines built by Messrs. J. J. Rusch, of Bornbirn, coupled to multiphase generators, giving 300 amperes at 5,200 volts, and constructed by the Austrian Siemens-Schuckert Werke, of Vienna. The station is situated near Rieden, and the electrical energy generated is transmitted a distance of 25 miles at a pressure of 25,000 volts. The total capacity of the Bregenz Co.'s plant is now 17,000 H.P.

Derby.—The T.C. has applied to the B. of T. for permission to use overhead mains to supply energy to the Parker Foundry Co.'s Steel Works and to the Peel Founary.

Falkirk.—On Friday evening there was a special meeting of the T.C. to consider the extension of the electrical undertaking, involving an immediate expenditure of £14,550, with a further expenditure in the course of a year of £10,000 to enable it to supply a larger area, including the foundries, with electric power, or as to calling in the temporary aid of the Scottish Central Electric Power Co. Mr. W. W. Lackie, of Glasgow, outlined a scheme for meeting the prospective demands for electric supply in the burgh, and recommended the adoption of a scheme which included the extension of the plant at the electricity station, with a loop cable running round the area of supply from which connections could be thrown off for consumers. In the event of the T.C. not feeling disposed to go on with the scheme, he recommended the disposal of the Council's existing electric light undertaking to the Scottish Central Co. in its entirety. The Council discussed the various aspects of the question at length. An amendment was moved in view of the heavy capital expenditure involved by the adoption of Mr. Lackie's scheme, that the Scottish Central Power Co. be asked for a period of two years to supply the Council with energy for the two works which had made application for it, at a rate not to exceed the terms already adjusted with one of the applicants. On a vote being taken, the amendment was carried, and the Council appointed a Committee to arrange terms.

The Secretary for Scotland has consented to the borrowing of a further sum of £15,000 for the execution of works under the Electric Light Order, 1901.

Hull.—The T.C. has referred to a Committee the question of renewing the contract for the supply of power to Messrs. Reckitt and Sons, who have asked for a reduction of the present charges. The Central Dry Dock Co. has also asked for a supply for lighting at the same charge as for power, as it contemplates lighting the whole of the works and shops by electricity.

Ilford.—The U.D.C. has reduced the charge for street electric lighting on the ordinary incandescent posts from £3 12s. 6d to £3 10s. per post per annum.

London.—HAMMERSMITH.—The B.C. has agreed to the terms suggested by the L.C.C. regarding a loan of £9,468 required for electrical purposes. With reference to the auditors' requirement as to charging the electricity accounts for 1907-8 with an additional sum of £5,651 for principal and interest repayments, the sum of £6,000 standing to the credit of reserve is to be appropriated for this purpose, the balance being obtained from unapplied surplus revenue.

Both the Gas Light and Coke Co. and the Brentford Gas Co. have approached the Council offering reductions in present charges with 5-year contracts. In the former case the company only made the offer, subject to the condition that none of the lamps should be converted from gas to electricity, and as some of the lamps are included in a scheme for conversion to electric lighting, which is now in hand, the Committee does not propose to entertain the offer. In the case of the Brentford Co., the offer involved a supply of gas for not less than 1,000 lamps, and as it also would interfere with prospective electric lighting, the Committee does not recommend acceptance of the proposal.

WESTMINSTER.—The City Council is to intimate to the L.C.C. that as the former body will eventually be responsible for the maintenance and lighting of Melbourne Place, it should have been given an opportunity of expressing its views as to the class of lighting to be adopted there, and that competitive tenders should have been obtained for both gas and electric lighting. The L.C.C. had previously issued an order to the Gas Light & Coke Co. for the supply of gas lamps.

BETHNAL GREEN.—The Electricity Committee has had under consideration the reference to it, from the Council, of the desirability of taking steps to secure a supply of energy for the borough, and to obtain schemes for that purpose. The Committee has instructed the town clerk to invite proposals from the several authorities and electrical undertakers authorised to supply within the borough, energy in bulk or otherwise.

L.C.C.—Notices are to be served upon the Bermondsey, Fulham, Hackney, Poplar and Southwark Borough Councils, and the South Metropolitan Electric Light and Power Co. and Westminster Electric Supply Corporation requiring them to provide and maintain testing stations in their respective distribution areas.

Lowestoft.—A L.G.B. inquiry was held on March 23rd into the application of the T.C. for a loan of £2,000 for house services. There was no opposition.

Maesteg.—The B. of T. has revoked the 1903 prov. order.

Mexico.—Canadian capitalists intend to erect an electric power plant on the Rio Conchas, a short distance from the town of Parral, at a cost of about £500,000. The initial capacity of the proposed plant will be about 15,000 H.P., and the power generated will be used for mining and irrigation purposes.

Perth.—It is proposed to light Glasgow Road, one of the principal thoroughfares in the city, with electricity.

Rotherham.—The R.D.C. has given permission for the T.C. to supply electricity to property in the parish of Whiston.

South Africa.—BRAKPAN (TRANSVAAL).—It is reported that an extraordinary incident happened on March 3rd in connection with the supply of power from the Victoria Falls Power Co.'s new station at Brakpan, the seriousness of which will no doubt be fully realised by those interested in the other companies who purpose erecting large generating stations for the supply of energy along the Reef. So far as is known, a hawk came in contact with the bare overhead H.T. lines carrying the current from Brakpan across the veldt, causing a short-circuit and burning off one of the wires, the free ends of which fell into the safety netting beneath, thus "earthing" the line. It appears that the effect of this was to set up a heavy "surge" on the system, which made itself felt at the generating end by breaking down the insulation of both the turbo-generators. This put the station out of action, and the old company's station had to be utilised, but was not, however, sufficient to meet the demand, the result being that some of the lines were seriously affected, and it was some days before both generators could be put into service again.

Southall-Norwood.—The U.D.C. has applied to the B. of T. for approval for the transfer of its 1905 Order to the Metropolitan Electric Supply Co., Ltd., for £165.

Tavistock.—The B. of T. has revoked the 1904 prov. order.

Walton-on-Naze.—Subject to the maximum charge for electricity being 6d. instead of 8d. per unit, the U.D.C. has decided to consent to the application of the Coast Development Corporation for a prov. order for E.L.

York.—The T.C. has received from the L.G.B. sanction to a loan of £27,143 for mains, motors, &c., and excess expenditure.

TRAMWAY and RAILWAY NOTES.

Cardiff.—The Tramways Committee has decided to appoint Mr. W. Howard Smith, of Westminster, to advise on the condition and upkeep of the tramway track, at an inclusive fee of 50 guineas. The proposed rate in aid for the tramways and electric lighting (estimated to produce £8,728) has been withdrawn.

Continental Notes.—GERMANY.—The discussion of the railway budget in the Prussian Diet on March 19th afforded a further opportunity to Herr von Breitenbach, Minister of Railways, to refer to the question of the conversion of State lines to electric

traction. He stated that the subject could only be held to be in prospect, if the transformation was associated with financial advantages. After referring to the lines between Berlin and Lichterfelde and between Blankenese, Altona, Hamburg and Ohlsdorf, the latter of which seemed to answer the purpose with single-phase alternating currents and overhead conductors, the Minister declared that, in view of the unusual progress of electrical engineering, an endeavour must be made to organise a trial on a main line both for passenger and goods traffic. The lines in view for the purpose were those between Magdeburg and Zerbst, Bitterfeld and Leipsig, and between Leipsig and Halle. It was hoped shortly to introduce a proposal for the adoption of electrical working on sections of these lines. As to the question of electric railways in competition with State railways, the Minister remarked that, in general, there was no objection to them for local traffic, as they relieved the State lines, but interurban railways were more doubtful, although the authorities were prepared to allow them as between Cologne and Bonn and Dusseldorf and Crefeld, if the easy conditions imposed by the State were fulfilled, as, for instance, in connection with the scheme for a line between Frankfort and Wiesbaden. It was added that a proposal to establish an electric railway between Cologne and Dusseldorf was under consideration, and that a decision on the matter would be arrived at shortly; but the efforts made to break down the principle of State railways by competitive projects would not be tolerated.

Hungary.—Plans are being prepared in respect of a projected electric railway between Znaim and Raabs.

Egypt.—The high-speed electric railway which the Cairo Electric Railways and Heliopolis Oases Co. is building between Cairo and Heliopolis, is well in hand. The company is also establishing a new electricity generating station at Choubrah, on the banks of the Nile. It will have a capacity of 10,000 H.P., and will supply energy not only for the electric tramways, but also for lighting in Heliopolis and for power purposes in the Cairo district.

Glasgow.—The tramways department officials have for some time been considering improvements on top-deck cars, and it is expected that in the near future cars of a new type will be introduced. In the improved car it is proposed making the inside several inches wider, while to prevent draughts, the side ventilators upstairs will be covered with a shield of perforated aluminium, and a system of fresh air supply from the roof will be installed. The truck will also be altered to give better running.

A discussion has occurred with reference to the placing of contracts with the Lorain Steel Co. for special track work, spare points and steel rails, and fish plates for the tramways department. In answer to a question, the convener of the Tramways Committee explained that it was not a very pleasant thing for him to have again to go out of the country for such articles. In the first case the offer of the Lorain Co. was £923, and the lowest British offer was £1,146, and there was nothing to choose between them for quality. In the next case the offer of the Lorain Co. was £1,067, and the lowest from home firms £1,134, while so far as rails and fish plates were concerned, the Lorain Steel Co. were prepared to land rails in Glasgow at £6 2s., while the lowest home offer was £9 12s 6d. per ton. Within the last week or two, representations had been made to him on behalf of one of the leading steel manufacturers in Lanarkshire, that if they got encouragement, they would lay down rolls for the production of steel rails. As the expenditure of the tramways department for rails was about £25,000 a year, they were prepared to give the proposal favourable consideration.

Hull.—A deputation waited on the Corporation Tramways Committee last week to urge the establishment of a tramway service to Stoneferry, within the city boundary. The Tramways Committee has apparently postponed the matter on account of the exhorbitant prices asked by owners of property for land for street widening. It was urged that part of the £150,000 which has gone to the rates out of tramway profit, might have found use in this way. The matter is to be considered by the Tramways Sub-Committee.

Hythe (Kent).—A poll of the ratepayers on the tramway scheme has resulted in a majority of 425 against the use of the overhead system. As a result the T.C. will oppose the Amended Tramway Bill which seeks consent for the overhead system.

London.—L.C.C.—The Highways Committee has had under consideration the construction of authorised tramways from the "Plough" Clapham, along Clapham Common to a point near Lavender Hill, and asks the Council to approve of the expenditure of £25,630 on this work.

The Committee recommends that notice should be served on the London United Tramways, requiring the company to sell to the Council the portions of its tramways (some 5½ route miles) situate in London.

The Council is asked to sanction the fitting up of two cars with electrical couplings so as to enable experimental use to be made of a single-deck car as a trailer in conjunction with another car, both cars having complete electrical equipments. The Committee considers that application should now be made to the Board of Trade and Commissioner of Police to sanction the use of trailers during the hours of busy traffic.

The agitation by the Fulham and Hammersmith B.C.'s and local trade unions for halfpenny fares on the new L.C.C. electric tramways between Putney, Fulham and Hammersmith has been successful, and halfpenny fares will shortly be in force on this route, the L.C.C. having given consent.

Middlesex.—At the meeting of the County Council on March 25th, the engineer was instructed to prepare the necessary plans for a tramway from Hertford Road, along Southbury Road to near Enfield Town Station.

Peru.—Mr. James Kerr Bock has recently returned from Peru, where he has spent several months preparing a report for the London Board on the advisability and practicability of electrifying the Central Railway system of that country. This railway, which comprises about 300 km. of track, mostly heavy grade, rises to an elevation of 16,000 ft. in the Andes, in a distance of 170 km. Hydraulic power is available. The cost of the conversion is estimated at over three-quarters of a million pounds sterling.

Soothill Nether.—Subject to the consent of the B of T., the U.D.C. has decided to lease the tramways to the National Electric Construction Co., Ltd., for 42 years from the opening, at a yearly rental of £1,744 10s. for the first 30 years, £284 5s. during the next 10 years, and £100 for each of the remaining years.

Southampton.—The manager of the tramway system has submitted to the T.C. an interesting report on the increase of units per car-mile used during the last year or two. In some towns the units per car-mile had gone up enormously, although Southampton's increase was not very great. Among the towns he had prepared a schedule of, there were only four in which the returns showed a decrease of units per car-mile. These were Reading, Bradford, Aberdeen and Leeds. The decreased consumption in Reading was attributed to strict supervision over drivers. Bradford stated that about 100 cars had been fitted with meters, and returns were issued showing the units used per car-mile and also per driver; this had a powerful influence in stopping waste. Aberdeen also recommended close supervision of the men to prevent "rushing" and abuse of the controller. The chief reasons given for the increased consumption per car-mile were careless driving, increased age and consequent wear of track, cars and equipment, and general increased speed of running on most tramways. In the manager's opinion a likely cause of increase was that the iron cores of the field coils and armatures had aged from constant use.

TELEGRAPH and TELEPHONE NOTES.

Africa.—The construction of the telegraph line between Timbuctoo and Niamey-Zuider is rapidly progressing, and it is expected that everything will be finished this year. The cost has so far amounted to 2,000,000 fr. The line is in the following sections: Timbuctoo-Bourem, 340 km.; Bourem-Niamey, 530 km.; and Niamey-Zuider 850 km.—Total 1,720 km.

Brazil.—A commission is to carry out the establishment of a wireless telegraph system for all Brazil, not only with respect to a system for army and navy and other national purposes, but for a public service as well.

Durban.—The Town Council has decided to substitute for the present flat rate for telephone service a message rate and annual charge combined. The following tariff has been adopted: Business telephones, £7 7s. subscription per year and up to 500 calls; domestic telephones, £5 5s. subscription per year and up to 500 calls; after the first 500 calls 1d. per message up to 3,000 calls, ½d. per message up to 6,000 calls, and ¼d. per message for all over 6,000 calls. This will necessitate the purchase of meters at an estimated cost of £1,500. The new tariff is to come into force from August 1st next.

Field Telephony.—The Japanese method of substituting the telephone where possible in field operations, in the place of visual signalling, is finding its way into European countries. The telephone has, of course, many advantages over the field telegraph on account of its sensitive nature. Not only is a great deal of time saved by substituting telephonic speech for the comparatively slow spelling out of the Morse code, but in case of breakdown due to faulty insulation, if speech fails, telegraphic signals may be substituted and will go through under extraordinary conditions. The Austrian artillery has just adopted a complete telephonic equipment for transmitting orders from headquarters. The telephone system is distributed among five patrols for each regiment, each of which has about two miles of wire and an exchange. The total outfit, which is carried in a telephone wagon, comprises about 15 miles of wire and the material for five stations.

Naval Telegraphists.—The telegraphist ratings in the Navy have hitherto been liable to be called upon for coaling ship, an occupation which naturally entails a considerable amount of rough manual labour. It has been represented that this is calculated to reduce their efficiency as operators for several days following; the qualities which are necessary in a telegraphist have no analogy with those requisite for the handling of coal, and their liability to be called on for this work has always been a sore point with these ratings. Accordingly the Admiralty has been pleased to direct that in future they shall be exempt from this work.

Russia.—The *Elektrotechnische Zeitschrift* states that attempts have been made on the iron telegraph wires of the railway system between Warsaw and St. Petersburg to communicate

between the two cities by telephone. Telephonic apparatus invented by Messrs. Kusnezow and Trechzuiski was employed, and the results are said to have been satisfactory.

South Africa. — In connection with the proposed arrangement by which Pretoria is to be the seat of the Government, whilst the legislative capital is to be Cape Town, it has been assumed that the two cities will be connected by trunk telephone lines, placing the Government Offices in Pretoria directly in communication with the Houses of Parliament in Cape Town. This would mean a very heavy capital outlay, one metallic circuit alone, using copper wires of 600 lb. per mile, being estimated to cost a quarter of a million sterling. As from various causes iron poles are necessary in South Africa for all aerial electrical services, both the initial cost of these and their subsequent transport form very heavy items in the construction account.

Spain.—Credits of £400,000 are demanded in the Spanish Cortes for the reorganisation of the posts, telegraphs, and telephones. Under the new project, 4,000 towns or communes will be united.

Telegraph Interruptions and Repairs:—

	Interrupted.	Repaired.
Port Arthur-Chifu	March 9, 1904	
Pontianak-Saigon	Sept. 16, 1908	
Tourane-Amoy	Jan. 19, 1909	
Cayenne-Salinas	Feb. 27, 1909	Mar. 29, 1909

Telephones in Naval Dockyards. — The telephone system is largely on the increase in the naval dockyards, and has to a great extent supplanted the older methods of communication. The residences of all officers in the dockyard have now been connected with the general exchange in the yard, so that they may be communicated with at any time of the day or night with the least possible delay. Now, however, a further extension has become desirable in order that the various heads of departments may communicate with their subordinates. Plans are already being submitted for the purpose of connecting up the various storehouses with their corresponding centres independently of the ordinary exchange. By this means it is anticipated that there will be a very great saving of time which is now wasted in waiting for authority to take action in certain cases on the one hand, and in getting answers to queries in respect of the work in hand on the other.

The Telephone Transfer.—Having in view the near approach of the transfer of the system of the National Telephone Co. to the Government, and the consequent cessation of new construction on the part of the company, the National Society of Telephone Employés regards the position with the greatest concern, and has issued a circular letter setting forth the case of its members. It is urged that the company and the Postmaster-General should make some arrangement for the continuance of constructional work, or that the latter should take into his employ the constructional staff as and when dismissed by the company, and carry out new work himself. The society points out that the responsibility for the lack of proper provision for the continuance of work rests with the Government, and suggests that the matter should be submitted to arbitration. In the case of an old exchange which ought to be replaced by new plant, the Post Office will have to purchase it as a working exchange; whereas if the company were to replace it before the transfer, the Government would only pay for the new exchange, and would allow nothing for the old plant. Obviously, therefore, the company cannot be expected to scrap old plant at this stage, and the service in many places is likely to suffer for several years before and after the transfer.

Wireless Telegraphy.—The Marconi wireless station at Glace Bay has been in direct communication with Paris, a distance of about 3,000 miles.

Wireless Time Signals.—The recent decision of the French Government to make a grant for the provision of apparatus by means of which the hour of midnight will be signalled from the Eiffel Tower will prove a boon to many navigators. It is the practice now, on a ship arriving in port, for the navigator to obtain a sight of the time ball, which is dropped from a conspicuous place in all large ports, for the purpose of checking his chronometer error. Now, however, a check can always be obtained at midnight in a ship fitted with wireless receivers, while it is within range of the Eiffel Tower. The reason that midnight has been selected instead of noon is due to the fact that wireless messages will reach to a very much greater distance during the hours of darkness, and consequently the midnight signal will be received over a very large radius.

CONTRACTS OPEN and CLOSED.

OPEN.

Australia.—Melbourne.—April 23rd. A power plant for the Central Telephone Exchange, Melbourne. See "Official Notices" March 5th.

Sydney.—May 31st. Two 4,700-K.V.A. turbo-alternators, with condensing plant, &c., and one 447-K.V.A. ditto, for the Council's electricity supply department. See "Official Notices" March 12th.

Belfast.—April 24th. Circulating pump and motor for the Laganbank Road pump house of the Tramways and Electricity Committee. See "Official Notices" to-day.

Belgium.—Brussels.—April 10th. Tenders are required for 10 lots of apparatus, appliances and material for electric lighting of railway trains, by the Administration de Chemins de fer de l'Etat Belge.

Blackpool.—Cables for the Electricity Committee. See "Official Notices" March 26th.

Cleckheaton.—April 19th. Cables for the electricity department for the year. See "Official Notices" to-day.

Dundee.—April 9th. The Electricity Department invites tenders for the supply of small coal, general stores, and meters.

Edinburgh.—April 16th. Underground conduits for the electricity supply department. See "Official Notices" to-day.

Fareham.—April 22nd. Electric supply mains, transformers and arc lamps and accessories for the Council. See "Official Notices" March 26th.

Glasgow.—April 5th. The T.C. invites tenders for axles, steel tires and wheels; chilled-iron brake blocks, car wheels, &c.; carbon brushes; V.I.R. cables, &c. Mr. J. Dalrymple, General Manager, 40, Bath Street.

Goole.—Electrical illuminations of grounds for gala, August 19th. T. D. Clegg, Arcade Sale Rooms, Goole.

Halifax.—April 16th. 14,000 tons of pea slack coal for the Tramways and Electricity Committee. W. M. Rogerson, General Manager. Deposit £5.

Holland.—Utrecht.—April 15th. The Holland Railways Co. requires tenders for copper wire, chemicals, and other telegraph material for the year 1909-10.

London.—Hackney.—April 22nd and May 6th. Arc lamp carbons for one year; also cables, troughing, &c. See two "Official Notices" March 12th.

Hammersmith.—The Electricity Committee proposes to invite tenders for certain new switchgear required for the No. 8 Richardsons-Westgarth turbine and alternator.

Stepney.—April 22nd. Pipework, valves, centrifugal pumps, hot-well, &c., for the Electricity Supply Committee. See "Official Notices" to-day.

Manchester.—April 5th. Signal, telegraph and electric light wires for the L. and Y. Railway Co. for a year. Mr. Waring, Stores Department, Osborne Street, Manchester.

Norway.—Drammen.—April 6th. Tenders are invited by the T.C. for one 1·5 ton and one 2·5 to 5-ton electric cranes for the harbour. Tenders to the Town Engineer. Local representation of tendering firm is essential.

Partick.—April 3rd. Materials for the T.C. electricity department. See "Official Notices" March 12th.

Rotherham.—April 8th. Petrol-driven tower wagon for the T.C. tramway department. E. Cross, Tramway Manager.

Southampton.—April 13th. The Corporation invites tenders for stores, &c., required in the Borough Engineer's department for a period of twelve months.

Swindon.—April 10th. Materials for the Electricity and Tramway Department. See "Official Notices" March 19th.

Woodbridge.—June 1st. The U.D.C. wants to hear from a company that would establish electric light works in its district, and light the streets electrically. See "Official Notices" March 26th.

CLOSED.

Barking.—In our list of tenders for the stokers required for the U.D.C. electricity works (see Electrical Review last week, p. 515), an inaccuracy unfortunately occurred. The contract referred to was unanimously placed with Messrs. Erith's Engineering Co., Ltd., of Gracechurch Street, E.C., for their grateless stokers, and not as stated. We understand that the Erith stoker was resolved upon by the Council after close investigation and visits to numerous plants which had been in regular operation for several years.

Belfast.—The Board of Guardians has resolved upon the lighting of the Abbey Sanatorium from the tramway cable at Greencastle. The estimated cost is £4,080, viz., laying main cable

from city boundary, erecting battery, switchboard, buildings for battery, motor-generator and regulator at the Abbey, as per the estimate of Mr. Bloxam, electrical engineer, £2,500; cables in grounds, electric fittings, &c., as per the estimate of Messrs. Young and Mackenzie, £1,580.

Belgium.—The Union Electrique Co., of Brussels, has secured a contract from La Société de Sambre-et-Moselle for the supply and erection of three three-phase alternators for the operation of rolling mills; one will be of 1,800 H.P., and the other two of 800 H.P. each.

Bexhill.—The T.C. has accepted the tender of Messrs. Belliss & Morcom, Ltd., for the supply and erection of a surface condenser, at £730; also the tender of Messrs. Hebb & Co. for supply and erection of a cooling tower, at £388.

Brighton.—The T.C. has renewed the contract with Messrs. C. G. Reed & Sons, Ltd., North Street, Brighton, for the supply of electrical fittings for six months.

Germany.—The Allgemeine Elektricitäts Gesellschaft, of Berlin, has secured a contract for the establishment of a central electric lighting station in the town of Pirmasens, at an estimated cost of £30,000.

Heston and Isleworth.—The District Council has accepted the following tenders for annual supplies for the electricity undertaking:—

W. T. Henley's Telegraph Works Co., Ltd.—Cables, disconnecting boxes and bridges.
Lucy & Co.—Service boxes.
British Insulated & Helsby Cables, Ltd.—Fuse boxes.
British Electrical Trade Supply.—Pitch compound.
Doulton & Co.—Earthenware troughs.
Mordey-Fricker Electricity Meter Co.—Slot meters.
Siemens Bros. and Venner & Co.—Meters.
General Electric Co.—Copper wire.
Sloan Electrical Co.—Carbons, &c.
Alex. Duckham & Co., Ltd., and Frank Cox.—Oils.

London.—L.C.C.—The Stores Committee on Tuesday recommended for acceptance tenders from the following:—

Motors and fittings.—British Westinghouse Co. and Dick, Kerr & Co., Ltd.
Controllers and controller parts.—British Westinghouse Co. and Dick, Kerr and Co., Ltd.
Armature and field coils.—British Westinghouse Co., £1,046; Manchester Armature Repair Co., £1,000.
Circuit-breakers and canopy switches.—British Westinghouse Co. and Dick, Kerr & Co., Ltd.
Contact fingers, finger-tips and segments.—Thomas Bolton & Sons, Ltd.; Brecknell, Munro & Rogers, Ltd.; British Westinghouse Co.; Dyer and Young, £103; Peter Hooker, Ltd., £376.
Iron and steel stampings.—Armstrong, Stevens & Son; J. B. Brooks & Co., Ltd.; Smethwick Stamping Co. (proprietors, The Valor Co., Ltd.); Stampings Alliance, Ltd.
Iron and steel forgings.—Bayliss, Jones & Bayliss, Ltd., £337; Deptford Engineering Co.; Frodingham Iron and Steel Co., Ltd., £1,636; John Holroyd & Co., Ltd.; F. W. Rowlands & Co.; Thomas Smith & Sons of Saltley, Ltd.; J. Stansfeld, Ltd., £286; United Electric Car Co., Ltd., £111; Wilkes, Ltd., £159; Woodall & Co.
Iron castings.—Brecknell, Munro & Rogers, Ltd., £103; East Ferry Road Engineering Works Co., Ltd., £562; Electro-Mechanical Brake and Engineering Co., Ltd.; S. Griffith, Railway Foundry and Engineering Works; Mountain & Gibson, Ltd.; Rodney Foundry Co., Ltd.
Steel castings.—Edgar Allen & Co.; W. Shaw & Co., £1,083; William Towler and Co., Ltd.
Malleable castings.—Brecknell, Munro & Rogers, Ltd.; John Crowley & Co., Ltd.; Leys Malleable Castings Co., Ltd.; William Towler & Co., Ltd.
Iron and steel castings for permanent-way.—Edgar Allen & Co., Ltd.; Falkirk Iron Co.; S. Griffith; J. Martin & Son, £452; Wm. Murrell & Co.; Moorwood, Sons & Co., Ltd.; Northamptonshire Direct Castings Co., Ltd., £343.
Gear and pinion wheels.—British Westinghouse Co., £550; F. W. Rowlands and Co., £2,815; E. G. Wrigley & Co., Ltd., £319.
Springs for electric car trucks, &c.—Cocker Bros., Ltd.; Samuel Cook & Co.; Lion Spring Co.; Mountain & Gibson, Ltd.; George Salter & Co.; Joseph Steel & Sons, £179; West Bromwich Spring Co., Ltd.

The following tenders for a spare armature for Nos. 2 and 3 dynamos at Blackwall Tunnel have been submitted:—

Westminster Engineering Co.	(accepted)	£184
J. G. Sneath		205
Crompton & Co.		—

For the renewal of feeder cables for the Rotherhithe Tunnel the following tenders were received:—

W. T. Henley's Telegraph Works Co.	(accepted)	£98
W. T. Glover & Co...		104
Callender's Cable & Construction Co...		106

The Stores Committee has recommended that the contract with Mr. G. Braulik for the supply of electric fittings under Schedule 6 B be terminated so far as it relates to the supply of switch lampholders under items 35, 36 and 37.

The Metropolitan Asylums Board has accepted the tender of Messrs. Tilley Bros. for electric wiring at the North-Eastern Hospital, at £5,064. This was the lowest tender. The Board's engineer's estimate was £5,200.

Hammersmith.—The Electricity Committee has recommended the acceptance of the tender of the Cadogan Ironworks, Ltd., for 30 arc lighting columns, at £1 6s. 6d. each, for the lighting of Latimer Road; the Committee will allow £2 per ton for damaged arc columns and scrap iron. Six hundred tons of Tareni coal for storing have been purchased from E. W. Cook & Co., at 11s. per ton.

Whitechapel Foundation.—Electric lighting is to be installed in the buildings of the Whitechapel Foundation. A new wing is in course of construction, and the Governors have decided to have the whole premises wired for electricity. Metal-filament lamps will largely be used. The contract has been placed with Messrs. C. Larkins & Co., Ltd., of Bush Lane House, E.C., who are carrying out the work so that it will pass the requirements of the L.C.C. The specification has been prepared by the architect, Mr. A. W. Cooksey. Messrs. C. Larkins are also doing the lighting of the new schools, which are being built for the Governors of the Sir John Cass Foundation in Duke Street, Aldgate, E.

Golder's Green.—Messrs. Francis Reade & Co., of Finchley, have received the contract for the whole of the lighting, with necessary transformers, for the bank and the bank house for Parr's Bank, at Golder's Green, N.W.

Newbury.—Messrs. Plenty & Sons, Ltd., have placed an order with the D.P. Battery Co., Ltd., of Bakewell, for a large renewal battery at Benham Park, Newbury. This plant is to take the place of a D.P. battery which has been in continuous use for over ten years.

Rosyth.—The contract for the new naval base at Rosyth, which has been let to Messrs. Easton, Gibb & Son, contractors, Westminster, consists of two portions; the first comprises a submarine depôt, boat slip, pumping station and electric power house, and is to be completed in 4½ years. The remainder of the work is to be done in 7 years. The naval base will be capable of considerable extension, and there is every reason to suppose that it will become a first-class naval port.

Southampton.—The T.C. has accepted the offer of a free trial, with the view of purchasing, a Weinland mechanical tube cleaner, from the Lagonda Manufacturing Co.

CONTRACTORS' COLUMN.

[The following information is published in the interests of electrical contractors and others who are seeking for openings for new business. Considerable expense is incurred in the production of this column, and every care is taken to ensure that the information is new and accurate, but it will be understood that in a matter where so many correspondents are engaged, and where the amount of information to be handled is very large, this cannot always be guaranteed. If alleged inaccuracies are reported to the Editors, they will be fully investigated.]

ABERDARE.—Ten houses in Monk Street and Trevor Street; two semi-detached villas in Monk Street; T. Roderick, architect, Aberdare.

ABERDEEN.—New halls in connection with Rutherford United Free Church (£1,600); Rev. D. M'Farlan. Alterations to premises in Wales Street, for John P. Kilgour, china merchant, Banff.

APPLEBY.—New schools for Westmorland C.C.; J. Hartley, architect, Swadford Chambers, Skipton.

ASCOT.—Two villas; W. Watson, builder, Ascot.

ASHFORD (Middlesex).—Secondary school (200 places); Education architect, Middlesex County Council, Guildhall, Westminster, S.W.

ASHTON-UNDER-LYNE.—Rebuilding Broom Inn; Gartsides' Brewery Co., Ashton-under-Lyne.

ATHERSTONE.—Pumping station; H. J. Coleby, surveyor, Atherstone.

ATHERTON (Lancs.).—Gasworks extension (£4,000); W. A. Schofield, surveyor, Council Offices, Atherton.

AUDLEY (Staffs.).—Alterations and improvements at the Church of England Schools; G. Balfour, Director of Education, Stafford.

AXBRIDGE.—New laundry, &c., at workhouse; W. Reede, clerk.

AYLESBURY.—Enlargement of schools (380 additional places), for Bucks. C.C.; C. G. Watkins, Education Offices, Aylesbury. Stables and stores for the Corporation; W. H. Taylor, Aylesbury.

BALLFESSON (I.O.M.).—New Wesleyan Church.

BANFF.—New science laboratory for Marnock School Board; T. Beattie, architect, Aberchirder.

BARNSLEY.—Ten houses in Sheffield Road, Worsborough, for G. Cooke; A. Whittaker, architect, Saville House, Worsborough Bridge, Barnsley. Four houses, High Street, Worsborough Dale, and four at Worsborough Bridge; G. Porter & Sons, Worsborough Dale.

BARNSTAPLE.—Refuse destructor; E. Saunders, Market Hall, Barnstaple.

BASCHURCH (Salop).—New farm buildings; E. Bourne, The Leesows Farm.

BASINGSTOKE.—Alterations and additions to premises for Conservative Association (£1,118); W. R. Howell, architect, 18, Percy Street, W.; Goodall & Sons, builders, Queen's Road, Basingstoke.

BATLEY.—Church (£6,000); Hoare & Wheeler, architects, 11, Orchard Street, London, W.

BEDFORD.—Two villas, Beverley Crescent; T. Dickens, Stanley Street, Bedford. Two villas, Shaftesbury Avenue and Kingsley Road; A. Hulatt, 18, Salisbury Street. Six houses, George Street; Dawes and Bowler, 25, Priory Street. Three houses, Dudley Street; Mrs. J. Pacey. New Bunyan Memorial Church, at Elstow (estimated £1,800 to £2,000); Usher & Anthony, architects, 9, St. Paul's Square, Bedford. Refuse destructor (£14,000); Mr. Greenshields, borough engineer.

BELSTONE.—Church Hall; E. Crocker, Queen Street, Exeter.

BEXHILL.—House and stable, Glover's Lane, for Mr. Goldsmith; J. B. Wall, architect, 13, Devonshire Road. Additions to Devonshire House, Hastings Road, for A. J. Sansom; G. H. Gray, architect, 21, Sea Road. Houses, Collington Avenue, for Moon & Garner, F. Allen and P. Jackson; C. W. Spencer, architect.

BEXLEY.—Library, Belle Grove Road, Welling, for the U.D.C.; T. G. Baynes, clerk, Bexley Heath.

BILSTON.—Stores and additions to depôt, &c.; V. Turner, surveyor, Bilston.

BIRKENHEAD.—Swimming baths (£18,000); C. Brownridge, borough engineer, Town Hall, Birkenhead.

BIRMINGHAM.—Alterations and improvements at the Noel Road Home for Girls (£300). Repairs, after fire, at the premises of the Art Silver Deposit Co., Key Hill Drive. New Council school in Sladefield Road, Ward End (1,000 children). Alterations to the "Saracen's Head" (£960); C. H. Collett, architect, Carlton House, High Street, Birmingham; W. J. Morris, builder.

(King's Heath).—Proposed school in Grove Road; E. Harper & Bro., architects, 191, Corporation Street, Birmingham.

BIRTLEY (Co. Durham).—Extensions at the Catholic Church (£1,000); Boyd and Groves, architects, Newcastle-on-Tyne; Burnett & Sons, builders, Birtley.

BISPHAM (near Blackpool).—Semi-detached houses, Warbreck Drive, for Mrs. E. Bikker; Arundel Road, for T. Butler.

BLACKBURN.—Probable developments at Park Bridge Mills; J. Thompson.

BLACKPOOL.—Sea water pumping station; J. S. Brodie, architect, Town Hall, Blackpool.

BLACKWOOD (Mon.).—Forty houses at Penmain, for the Oakdale Building Club; Webb & Davies, joint architects, High Street, Blackwood.

BOGNOR.—Pavilion (1,000 places); E. A. Bridges, Bognor.

BOLTON.—Five houses, Hawthorne Road; G. Ryley. Two houses, Cambridge Road, Heaton; W. Gornall. Eight houses, Chorley Old Road; W. C. Matthews. Skating rink at Dofficockers; A. P. Patterson. Skating rink, Manchester Road; Messrs. Prescott & Bold. Skating rink, Spa Road; T. E. Smith.

BOURNEVILLE.—New infants' school in Linden Road (298 places); managers, Bourneville School.

BRADFORD.—Proposed central tramcar shed (£20,000); tramway engineer, Bradford.

BRENTFORD.—Additions and alterations to Town Hall; N. Parr, surveyor, Town Hall, Brentford.

BRENTWOOD AND BILLERICAY.—Sewage disposal and pumping station; Willcox & Raikes, 63, Temple Row, Birmingham.

BRIDGEND.—Offices for Guardians; P. Thomas, Bridgend.

BRIDLINGTON.—Additions to Fort Hall; E. R. Matthews, surveyor to Bridlington Town Council.

BRIERFIELD (LANCS.)—Probable rebuilding, after fire, of Brewery Street weaving shed; Beevers Bros., cotton goods manufacturers.

BRISTOL.—Locomotive sheds, for the G.W. Railway; A. N. Coles, builder, Plymouth. Chancel, with vestries, &c., at Church of St. Anne (£1,264); H. M. Bennett, architect, 36, Corn Street, Bristol; R. Wilkins & Sons, builders, Bristol. Sack shed, messroom and offices. Royal Edward Dock, for the T.C.; W. W. Squire, engineer, Cumberland Road, Bristol.

BROMLEY.—Seven houses, Blandford Road, for H. C. Wilson; conversion of houses into shops, 71 and 73, High Street, for J. Borrowman.

BRYNMAWR.—New business premises at Beaufort Street; H. B. Jones, architect, Brynmawr.

BUGLE (CORNWALL).—Two houses, for T. Jane; and residence, for C. H. Pascoe.

BURNLEY.—Skating rink, Church Street; S. Taylor, Manchester Road, Burnley. Extension to ice factory; J. H. Pickles, architect, Burnley.

BURTON-ON-TRENT.—Police station (£13,000); J. T. Lynan, architect, Burton-on-Trent.

BURY.—New Wesleyan Chapel at Elton; new skating rink, H. Riley, secretary and manager; repairs at wheelwrights' shop, after fire, J. Metcalf.

BUXTON.—Enlarging mineral baths; W. H. Grieves, Buxton.

CARDIFF.—New pavilion in Marlborough Road; E. J. Kean, architect, Cardiff. Alterations and additions at 4 and 5, Mount Stuart Square for offices, for H. A. Griffin (£1,000); I. P. Jones, architect, Cardiff. Nine houses, Library Road, for C. C. Dunn, architect, Cowbridge Road, Cardiff.

CARSHALTON.—Four houses, Hawthorn Road and Fairview Road; Windebank & Co., builders, Hillcrombe Road, Sutton.

CAVERSHAM.—Two blocks at Isolation Hospital; A. J. Smith, Caversham. Proposed fire station; A. J. Smith, Caversham.

CHAPEL-EN-LE-FRITH.—Primitive Methodist Church and schools, Market Street (£2,000); Bryden & Walton, architects, Buxton.

CHARTHAM DOWNS (near CANTERBURY).—Recreation rooms, &c., at the County Lunatic Asylum; W. J. Jennings, architect, 4, St. Margaret's Street, Canterbury.

CHATHAM.—New schools at Luton; H. H. Dunstall, architect, 2, The Paddock, Chatham.

CHELTENHAM.—Extensions to Corporation depôt sheds; J. S. Pickering, architect, Cheltenham.

CHORLEY.—Houses, Mayfield Road, for Geo. Marginson; Windsor Road, for Jas. Brindle & Sons, builders, 88, Clifford Street; Froom Street, for S. Froom & Sons, builders, 18, Seymour Street; Chapel Lane, Coppull, for Robert Wilson.

CLWTYBOUT (CARMARTHENSHIRE).—Additions to "Caleddfrwd," for Dr. D. R. Evans; E. F. White, architect, 17, Bridge Street, Carnarvon.

COMBE HAY (SOMERSET).—Council School; C. H. Bothamley, secretary to the County Education Committee, Weston-super-Mare.

CONSETT.—Extensions to the Technical Institute for Durham C.C. (£7,800).

CORK.—Veterinary premises in Sheares Street, for Mr. M'Swiney; J. F. M'Mullen, architect, 30, South Mall, Cork.

COVENTRY.—Alterations to premises, Cross Cheaping, for Banks & James, tobacco manufacturers, Ford Street. Alterations to premises, 20 and 21, Cross Cheaping, for Geo. Barber. Additions to premises, Gosford Street, for W. Brookes. Additions to premises, Cheylesmore, for W. W. Curtis, Ltd.

CREWE.—Proposed ice factory off Groby Road, for the Crewe and District Ice Co.

CROOK (Co. DURHAM).—Suggested new girls' and infants' schools.

CROSBY (LINCS.).—Additions to elementary school; Scorer & Gamble, architects, Lincoln.

DARLASTON (near WEDNESBURY).—New Primitive Methodist Church, Slater Street; Hammond Bros., builders, Darlaston.

DARTFORD.—Municipal offices for the U.D.C. (£6,000); W. Kay, clerk.

DEWSBURY.—Three houses at Northfields; Kirk, Sons & Ridgway, architects, Market Place, Dewsbury.

DUDLEY.—High School for girls (350 places); J. Hutchings, architect, County Education Offices, Stafford.

DUNSTON (near LINCOLN).—Wesleyan Sunday Schools; J. R. Halkes, architect, 11, Mint Street, Lincoln.

DURHAM COUNTY.—New cookery centre at Esh, and alterations and improvements at the Annfield Plain Infants' School; F. E. Coates, architect for cookery centre, Shire Hall; W. Rushworth, architect for infants' school, Shire Hall, Durham.

EASTBOURNE.—Skating rink on pier; Manager, Eastbourne Pier Co.

EDINBURGH.—Alterations in Parish Council offices; R. M. Cameron, architect, 53, Great King Street.

ELTHAM.—Extensions and alterations to Holy Trinity Church. Four houses, Glenhouse Road; A. C. Corbett, care of J. J. Bassett, 121, Earlshall Road, Eltham.

ENFIELD.—Houses, Ladbroke and Alberta Roads (£2,835). F. Bethell, architect, 23, Queen Annes Place, Bush Hill Park, Enfield.

ENNISKILLEN.—Improvements at County Fermanagh Hospital; Old Gaol Infirmary to be converted into technical school.

EXETER.—Residence, Barnfield Crescent, for Dr. H. Tosswill; R. M. Challice, architect, 14, Bedford Circus, Exeter.

FALKIRK.—New offices in High Street, for the *Falkirk Herald*.

FALMOUTH.—Pair semi-detached residences in Gyllyngvase Lane, for T. J. Pye, builder, Falmouth. Extensions to A. Parodi's fish-curing establishment in Bar Yard. High school for girls; S. Hill, architect, Redruth.

FENTON.—Eight houses, Carron Street, for J. R. Warrilow; seven, Wallis Street, for H. J. Wilshaw; houses, King Street, for J. Shenton.

FIFE.—Proposed recreation rooms for Territorials; Gillespie & Scott, architects, St. Andrews.

GAINSBOROUGH.—Additions to school, Ropery Road; Scorer & Gamble, architects. Bank Street Chambers, Lincoln.

GATESHEAD.—Alterations and additions to the workhouse at Bensham; Newcombe & Newcombe, architects, 89, Pilgrim Street, Newcastle. Church school (£6,000); Marshall & Tweedy, architects, Newcastle-on-Tyne.

GELLIGAER.—Thirty houses at Gelligaer Village; W. Harris, architect, Bargoed.

GOODMAYES (ESSEX).—Congregational Church; Smee & Houchin, architects, 85, Fleet Street, E.C.

HANLEY.—Alteration of business premises, 27, Piccadilly, for Mr. Skerrett, jeweller.

HASLINGDEN.—Municipal housing scheme; Borough Surveyor.

HAWICK.—New "Anderson" ward at the Cottage Hospital (£500).

HEREFORD.—Probable reinstatement after fire, of portion of Thinghill Mansion, Withington, residence of Dr. E. W. Abbott (damage about £5,000).

HIGH WYCOMBE.—Stabling and store, Baker Street, for W. C. Loosley; three houses, Kitchener Road, for H. T. Dickens; two houses, Terriers, for A. W. Nash; and two houses, West Wycombe Road, F. Hunt.

HOLSWORTHY (DEVON).—Chapel (£2,500); T. Parsons, Holsworthy.

HORDEN.—School (£3,000); F. Coates, Shire Hall, Durham.

HUDDERSFIELD.—Bank premises; J. Berry, architect, Market Place, Huddersfield; E. Jowett, builder, Huddersfield.

HULL.—Warehouse and office, Wilton Street, for J. Downs; additions to works at Stoneferry, for Robson's Cement Co., Ltd.; extensions to works, Waterhouse Lane, for the Humber Brass and Copper Works Co. Additions to the Phœnix Printing Works, Manor Street, for M. Harland & Son; A. Easton, architect, 7, Land-of-Green-Ginger, Hull.

HYDE.—Improvement of Horiley Brow Primitive Methodist Church. New premises for local P.S.A. Brotherhood (£3,000).

ILFORD.—Houses, four in Eton Road, for E. Partridge; five, Auckland Road, for H. Hollins; lock-up shops, Station Bridge, for the G.E. Railway. Four houses, Mortlake Road; P. Cornish, architect, 641, High Road, Leytonstone. Four houses, Kinfauns Road; E. Dunn, architect, 7, Roding Street, Ilford.

IRLAM (near MANCHESTER).—Proposed New Church; Rev. R. Martin, vicar of Irlam.

KETTERING.—Houses (10) in Kingsley Avenue, for the Co-operative Society; temporary church, Roundhill Road, for Rev. P. M. Smythe; church-room, Canon Street and Club Street, for the Committee of the Seventh Day Adventists.

KIDSGROVE.—Surface developments; Birchenwood Colliery Co., Ltd.

KINSALE.—New Carnegie Free Library contemplated (£1,750).

LEIGH (LANCS.).—Extensions at St. Thomas's Church; J. Gerrard & Sons, contractors, Swinton, near Manchester.

LEVEN (FIFE).—Proposed new Drill Hall for Fife Territorials (£2,000); Gillespie & Scott, architects, St. Andrews.

LICHFIELD.—Barracks, &c., at Whittington, for the War Office; E. J. Chattle, builder, The Central, Rotton Row, Lichfield.

LIVERPOOL.—Warehouse (£12,000); Walker & Strong, architects, Dale Street, Liverpool; A. Readdie, builder, Cambridge Street, Liverpool.

LIVERSEDGE.—Semi-detached villas, Hindley Road, for S. Drake.

LONDON.—(HAMMERSMITH, W.).—Alterations, &c., to Palace Theatre; London, Provincial and Continental Vaudeville Combination, Adelphi Terrace House, W.C. Buildings in Rylett Crescent and Hartswood Road; F. E. Rosser. Motor garage in Paddenswick Road; J. H. Richardson.

(CAMBERWELL, S.E.).—Proposed tramway shelter, Denmark Hill; W. Oxtoby, engineer, Camberwell Town Hall, Peckham Road, S.E. Buildings in Southampton Street and Cottage Green, for F. Flower.

(KENNINGTON, S.E.).—Building in Gasholder Place, Upper Kennington Lane, for H. P. Mundy; J. A. J. Woodward & Sons.

(PLUMSTEAD, S.E.).—New church, &c., Robert Street; Henry Harper, architect, 54, Long Row, Market Place, Nottingham.

(HENDON, N.W.).—Two houses, Park Drive; W. J. King, builder, North End Road, Hampstead, N.W.

(PICCADILLY ARCADE, W.).—Twenty-six shops; F. Bush, builder, Ridgmount Street, W.C.

(GREENWICH, S.E.).—Addition to 56, Trafalgar Road, for Capt. W. Warburton, R.E.

(FULHAM, S.W.).—Alterations to 482 and 484, Fulham Road; G. A. Gale, The Broadway, Walham Green, S.W.

(CHELSEA, S.W.).—Conversion of stable premises in Lacland Place into motor garage, for the London Improved Cab Co., Ltd., Pakenham Street, W.C. (buildings at present lighted by gas).

(KENSINGTON, W.).—Shop at Knightsbridge Green; T. H. Watson, care of Bradford Estate Co., Ltd.

(BARNES, S.W.).—Additional block at the isolation hospital (£3,000); G. B. Somes, Council Offices, Barnes.

(W.).—Electric theatre on site of 225, Oxford Street, and 2-10, Hills Place; M. S. Ward, architect, 100, Victoria Street, S.W. Adaptation of 833, Oxford Street, for Old Oak Tea House, 37, Old Bond Street; Whitby Bros., builders, Featherstone Buildings, Holborn.

(WALTHAMSTOW, N.E.).—Two houses, Woodlands Road; W. Sizer, builder, 46, Church Hall Road, Walthamstow. Three houses, Gloucester Road; H. Brodey, architect, 259, High Street, Walthamstow.

(FINCHLEY, N.).—Additions to the higher elementary school (£800); Education Architect, Middlesex County Council, Guildhall, Westminster, S.W. Four houses, Village Road, for the Finchley Co-partnership Society.

(HENDON, N.W.).—Eighteen houses, Willifield Way, Temple Fortune Hill and Erskine Hill, for Hampstead Tenants, Ltd. Two houses, Hampstead Way; A. Bretzfelder, builder, 18, Cavendish Mansions, Hampstead, N.W. Three houses, Golder's Green Road; E. Streather, builder, Golder's Green, Hendon, N.W.

(EALING, W.).—Alterations to business premises, 9, New Broadway, for Messrs. Squire, piano dealers.

(BERMONDSEY, S.E.).—Building in Tower Bridge Road and Sun Street, for Feltham & Co.

(PECKHAM, S.E.).—Adaptation of portion of Rye Lane tramways depôt as skating rink, for F. C. Bostock.

(KINGSWAY, W.C.).—Building in Gate Street; Barlow & Roberts, builders, 15, Redcross Street, S.E.

(N.W.).—Shop in Kentish Town Road; D. Joseph, architect, 73, Basinghall Street, E.C.

LONGFORD.—Prospective rebuilding, after fire, of the Workhouse.

LONGTON.—Extension of Sandford Hill Primitive Methodist Church (£1,000). Additions to St. Mary's Works, High Street, for T. C. Wild.

LYE (near STOURBRIDGE).—New schools, workshops, &c. (£4,000).

LYNTON.—New Wesleyan Church; La Trobe & Weston, architects, 44, Corn Street, Bristol.

MALTBY (near ROTHERHAM).—Model buildings for the Maltby Colliery Co., Ltd.

MANCHESTER.—New infants school at Old Trafford (£4,900); H. Littler, County architect, Preston. New colony of houses at Chorlton; Dawson & Vowles, estate agents, Manchester. Premises, Peter Street, for the Manchester and Salford Wesleyan Mission (£55,000).

MANSFIELD.—Alterations and additions to Hermitage Mill, for S. Eden and Son.

MARGATE.—Motor Garage, Cecil Square, for B. Shadbolt. Conversion of houses into shops, Milton Road, for W. L. Bennett. Houses, Victoria Avenue; S. E. Burrows, architect, 6, Cecil Street, Margate; Northdown Road and Norfolk Road, for Moody & Chrisfield.

MERTON.—Extension of depôt (£500); surveyor to the U.D.C.
METHVEN (Perthshire).—New school; clerk, School Board, Methven.
MIDDLESBROUGH.—Alterations to passenger station, for the N.-E R. Co Proposed new operating theatre at the North Riding Infirmary.
MIRFIELD (Yorks).—Houses, Kitson Hill Road, for G. Kilner; Old Bank Road for S. Berry. New school buildings at Calder Farm Reformatory.
MOORLEY EDGE.—School (£2,500); W. Rushworth, architect, Durham; Cleary & Charlton, builders, Sunderland.
MOSSLEY.—Sewage works extension (£9,000); Borough Surveyor.
MOUNTAIN ASH.—Electric station at Ynysybwl, for the U.D.C.; Williams Bros., builders.
MUMBLES (Glam.).—Baptist Chapel; H. A. Ellis, architect, 10, Fisher Street, Swansea.
MUSGRAVE (near Kirkby Stephen).—Renovation of Parish Church; The Vicar.
NAAS.—Old gaol to be converted into a brewery.
NAFFERTON.—Water supply scheme for Driffield R.D.C. (£3,660); Fairbank and Son, engineers, York.
NANTWICH.—Renovations after fire; E. Furber, Brine Pits Farm, Austerson, Nantwich.
NEWARK.—Shops and houses at Balderton, for the Co-operative Society; R. Worcester, architect, Co-operative Wholesale Society, 1, Balloon Street, Manchester.
NEWCASTLE-UNDER-LYME.—Rebuilding business premises, 1, Red Lion Square, for Mr. Skerrett, jeweller.
NEWQUAY.—Sewerage scheme for the U.D.C. (£11,000).
NORWICH.—Underground lavatories, Market Place, for the T.C. (£2,800); A. E. Collins, city engineer. Wesleyan school-chapel and classrooms.
NOTTINGHAM.—Large block of shops and offices; A. H. Goodall, architect, Nottingham; G. A. Pillatt, builder, Sherwood Street North, Nottingham.
NUNEATON.—Proposed abattoirs; F. Cook, Nuneaton.
OAKHAM (Rutland).—Cottage Hospital.
OKEHAMPTON (Devon).—Proposed higher elementary school (£3,000); J. F. Young, Education Secretary.
OLDHAM.—Renovation of Union Street United Methodist Church.
PENWORTHAM (near Preston).—New Wesleyan church and schools.
PETERHEAD, N.B.—New Post Office, corner of Marischal and Thistle Streets (£5,000); J. Watt, architect, 12, Andrew Street, Peterhead.
PLYMOUTH.—United Methodist Church at Pomphlett (£2,100); Hine, Odgers and May, architects; J. Paynter, builder.
POLLOKSHIELDS.—Church (£9,000); Stewart & Patterson, architects, Blythswood Square, Glasgow.
PONTARDAWE (Glam.).—New offices for the B.G. (£1,500); A. M. Leon, architect, Cardiff.
PONTYPRIDD.—Three shops, with offices over, in Mill Street; Evans, Williams & Evans, architects, Pontypridd.
PRESTWICH (Lancs.).—Offices and stores at Corporation depôt; S. Morgan, architect, Prestwich.
RADCLIFFE.—New District Council offices; R. Holt, architect, 8, Victoria Street, Liverpool. Alterations at Conservative club; Secretary of the Club.
RAMSGATE.—Rebuilding of shop premises, Grange Road, after fire; Grummant Bros., builders, Grange Road, Ramsgate.
RAWTENSTALL.—Rebuilding bank premises at Bacup Road, Waterfoot, for the Lancashire and Yorkshire Bank, Ltd., Manchester; additions to Longholme Mills, for R. Ashworth, woollen manufacturer.
ROGATE.—House and stabling (£3,432); W. R. Howell, architect, 18, Percy Street, W.; G. A. Kemp & Sons, builders, Greatham.
ROCHDALE.—Alterations to business premises, 33-53, Cheetham Street, for J. Blakelock, house furnisher.
ROMFORD.—Proposed houses (80) on new estate at South Hornchurch, for the Workmen's Dwellings Syndicate (H. A. Gower, secretary); high school for Essex C.C. (£13,000); proposed new Post Office (£4,700).
ROTHERHAM.—Sewerage and sewage disposal scheme for the R.D.C. at Laughton-en-le-Morthen (£9 875); Fowler & Marshall, engineers. School, South Grove, for the T.C.; S. Hey, Director of Education, Town Hall, Rotherham.
RUSKINGTON (Lincs.).—New Wesleyan schools; Bilson & Phillips, builders, Ruskington.
ST. ANNES-ON-SEA (Lancs.).—New hydro hotel, opposite the pier.
ST. AUSTELL.—Three houses, at Slades, for Mrs. Kent.
ST. BLAZEY (Cornwall).—Business premises for J. Bennett, Station Road, St. Blazey.
ST. HELENS.—New church to replace Denton Green Wesleyan Church. New St. Joseph's Schools; M. Honan, architect, Liverpool; Geo. Scott and Co., builders, St. Helens.
SALFORD.—Church; T. H. Cunliffe, architect, 2, John Dalton Street, Manchester.
SHERBURN HILL (near Durham).—New premises for the Co-operative Society; J. W. Taylor, architect, St. John Street, Newcastle-on-Tyne.
SHIREMOOR (near Newcastle-on-Tyne).—New club premises and hall for the Workmen's Club, Earsdon Road.
SKEGNESS.—Additions to elementary school; Scorer & Gamble, architects, Bank Street Chambers, Lincoln.
SOUTH DARLEY.—Water supply scheme, for the U.D.C.; Streets & Co., contractors, Guildford.
SOUTH KILLINGHOLME (Lincolnshire).—New elementary school; Scorer and Gamble, architects, Bank Street Chambers, Lincoln.
SOUTHPORT.—Alhambra Pleasure Palace, in Lord Street; H. A. Turner, architect, Manchester. Public conveniences, South Marine Park, for the T.C.; G. Duxfield, builder, Southport.
SMALLTHORNE.—Eight houses in Thomas Street, for T. J. Lockett. School in Leek Road; Mr. Hutchings, architect, County Hall, Stafford.
SMETHWICK.—Rebuilding plating department, &c., at Credenda Works, Burge Street, for Phillips & Co., motor and cycle accessories manufacturers.
SOUTHEND-ON-SEA.—Lecture hall; Burles & Harris, architects, Southend-on-Sea.
STEVENAGE (Herts.).—New Council school; U. A. Smith, County Surveyor, Hatfield.
STOCKTON-ON-TEES.—Catholic school (£3,000); A. Harrison, Stockton-on-Tees.
STOKE-ON-TRENT.—Proposed new Town Hall and municipal buildings (£20,000); borough surveyor. Ten houses in Yoxall Avenue, for J. Boston. Petrol stores, shed, &c.; H. E. Moody. Warehouse in Welch Street; T. Shenton. Two houses, Till & Willshaw.
STOKE-UNDER-HAM (Somerset).—Wesleyan church and schools; La Trobe and Weston, architects, 44, Corn Street, Bristol.
SWANSEA.—New Glynn Vivian Art Gallery for the T.C.; G. Moxham, architect, 39, Castle Street, Swansea. Alterations and improvements at Sardis Congregational Church (£2,000).
TAUNTON.—Additions to Railway Inn, Station Road; Messrs. Arnold, brewers, Taunton. Remodelling of coachbuilders' premises, and new garage for Marshalsea Bros., East Street.
THORNLEY (Co. Durham).—New Catholic schools; Mr. Johnson, builder, Stockton-on-Tees.
TONBRIDGE.—Rebuilding of premises for H. E. Hall & Co., engineers.
TONYREFAIL (Glam.).—New police station; T. M. Franklen, Clerk to the Glamorgan C.C., County Offices, Cardiff.
TRIMDON.—Co-operative premises; J. Hayes, architect, Wingate, Durham.
USWORTH (Co. Durham).—New Wesleyan Sunday schools and class-rooms, in Edith Avenue; J. W. Taylor, architect, St. John Street, Grainger Street West, Newcastle-on-Tyne.
UTTOXETER.—Water-works developments (£3 000) and re-modelling of local cattle market; Surveyor to the Council.
WAKEFIELD.—Rebuilding Dolphin Inn; Simpson & Firth, architects, Southgate Chambers, Wakefield.
WALKDEN.—Alteration of shop property; T. Ball, grocer, Walkden.
WALLASEY.—Floral pavilion and concert hall at New Brighton; Surveyo Council Offices, New Brighton.
WARRINGTON.—Rebuilding Golborne Street Baptist Church (£3,000).
WATERFOOT (near Rawtenstall).—Ten houses, Cowpe Road, for J. Trickett; R. Cunliffe, architect, Willow Street, Waterfoot.
WELLINGBOROUGH.—Additions to shop, High Street, for W. Pendered; alterations to house and new bakery, Havelock Street, for J. Lea; six houses, Albert Road, for J. Williams.
WHITECHURCH.—Proposed new school, Salisbury Road; E. C. Peele, secretary, Shropshire Education Committee, Shrewsbury.
WHITTLE-LE-WOODS (near Chorley).—Enlargement of St. Chad's Roman Catholic Church, South Hill (£1,150).
WIGAN.—Extension at local electricity station; Borough Electrical Engineer.
WINDERMERE.—Premises, Crescent Road, for the Bank of Liverpool, Ltd.; Walter, Carter & Walker, architects, Windermere.
WINSFORD (Cheshire).—Proposed new operating theatre at the infirmary (£700).
WIRKSWORTH (Derbyshire).—Supplemental water supply (£7,000); Surveyor, Council Offices, Wirksworth.
WOLSTANTON (Staffs.).—Shop, for G. H. Davenport; alterations and additions to the Railway Inn, Chesterton, for Parker's Burslem Brewery Co., Ltd.; alterations and additions at Red Mine Briquette Works, Knutton, for F. J. Ketley; three houses, Castle Street, Chesterton, for S. Cork.
WOLVERHAMPTON.—New baths for the T.C.; G. Green, borough engineer, Town Hall.
YNYSYBWL (near Pontypridd).—Church and hall, for the Vicar of Llanwonno; T. E. Richards, architect, Pontypridd.
YORK.—Extensive additions to Clifton Asylum for the North Riding of Yorks. C.C. (£15 690); F. Jones, architect, York; Wm. Nicholson & Son, Ltd., builders, Sheaf Street, Leeds.
YORKSHIRE (West Riding).—Elementary schools at Cononley, Barnoldswick, Kirkburton and Littlemoor.

FORTHCOMING EVENTS.

Royal Institution.—Friday, April 2nd. At 9 p.m. Discourse on "Electrical Striations," by Prof. Sir J. J. Thomson.

Saturday, April 3rd.—At 3 p.m. Lecture on "The Properties of Matter," by Prof. Sir J. J. Thomson. (Lecture VI.)

Salford Technical and Engineering Association.—Saturday, April 3rd. At 6.45 p.m. Lecture on "The Telephone," by Mr. M. S. Connor.

Liverpool and District Electrical Association.—Saturday, April 3rd. At 3 p.m. Visit to the Liverpool Electric Cable Co.'s Works. Meet at Works.

Institution of Mechanical Engineers (Graduates' Association).—Monday, April 5th. At 8 p.m. Paper on "Mechanical Draught for Boilers," by Mr. L. J. J. Murfin.

Royal Society of Arts.—Monday, April 5th. At 8 p.m. Cantor lecture on "Steam Turbines," by Mr. G. G. Stoney. (Lecture III.)

Institution of Civil Engineers.—Wednesday, April 7th. Students' visit to the Chingford Reservoir Works of the Metropolitan Water Board.

THE ELECTRICAL ENGINEERS
(LONDON DIVISION).

The following orders are issued:—

Commanding Officer—Col. R. E. B. Crompton, C.B.

Monday, April 5th.—"A" Company. Infantry drill, 6 to 7 p.m. Technical drill, 7 to 9.30 p.m.

Tuesday, April 6th.—"B" Company. Infantry drill, 6 to 7 p.m. Technical drill, 7 to 9.30 p.m.

Thursday, April 8th.—"C" Company. Infantry drill, 6 to 7 p.m. Technical drill, 7 to 9.30 p.m.

Friday, April 9th.—"D" Company. Infantry drill, 6 to 7 p.m. Technical drill, 7 to 9.30 p.m.

N.C.O.'s and men attending the Easter training parade at the Headquarters, Regency Street, S.W., at 3 p.m. Service dress (marching order).

(Signed) J. H. S. Phillips,
Capt. and Acting Adjutant.

Airdrie and Coatbridge Tramways Co., Ltd.—The report for December, 1908, shows new expenditure on capital account £137, making the total £67,200. The revenue for the year was £11,808, and the expenditure, including £800 permanent way renewals provision, was £10,054, leaving £1,754 + £778 brought forward. There is to be carried to reserve sinking fund for loan redemption £200, and to general depreciation £250; a dividend of 4 per cent. per annum on the ordinary shares is paid, £282 being carried forward.

Browett, Lindley & Co., Ltd.—The directors' report for 1908 shows a gross profit of £4,343. £6,309 has been written off for depreciation. Debenture and loan interest required £2,031, and £366 has been placed to the investment reserve. There is a net loss on the year of £4,352.

NOTES.

Next Week's "Electrical Review."—In accordance with our custom in recent years, the issue of the Electrical Review which is due to appear on Good Friday morning will be published two days earlier—namely, Wednesday morning, April 7th. Correspondents and contributors are requested to note the following arrangements:—

All matter for the "*Correspondence*" pages should reach this office by first post on Monday morning. *Notes and News matter* should reach us in the course of the same day, though late news of special interest will be welcomed up to early on the morning of Tuesday, April 6th.

Our *Advertisement Department* announces the following arrangements:—

New copy and alterations to existing displayed Advertisements should be received not later than Saturday morning, 3rd inst. (to-morrow).

Official Announcements and Prepaid Advertisements can be received up to 9.30 a.m. on Tuesday, the 6th inst.

The E.C.A. Liverpool Branch.—The monthly meeting of this branch of the Electrical Contractors' Association was held on March 17th, Mr. W. Sutton presiding. The hon. secretary stated that seven municipal bodies were applying for power to carry out electrical contracting work, and the Association had entered opposition to all the applications. He was pleased to say that the Cardiff Corporation had decided to abandon its application. With regard to the proposed agreement with the manufacturers and factors, the hon. secretary read a letter from Mr. Tate requesting members to let him have the names of firms from whom they chiefly purchased their goods. With regard to the sale of tantalum lamps, a letter was read from Messrs. Baxendale Bros, Liverpool, stating that they had refused to supply a firm who were selling the lamps at 2s. 2d. until they received a declaration from the firm that they would not retail them below the minimum agreed price. Mr. Scott complained of a factor in Liverpool selling direct to a consumer at trade prices, and the hon. secretary was instructed to write the firm in the matter. The hon. secretary gave a detailed account of the satisfactory result of the C.M.A. and E.C.A. agreement, showing the benefit each member of the Association would receive, and the chairman earnestly appealed to all members of the branch to support C.M.A. as much as possible during the ensuing year, as by doing so they would not only greatly benefit themselves but would help to further strengthen the Association as a whole. Several members inquired whether bitumen and paper-insulated cables would be included in this year's agreement, as, if so, members would also purchase them from Association firms. Mr. Rhodes informed the meeting that a further 29 men had been added to the register since February 10th. Mr. Scott brought forward for discussion the qualification of a "wireman." He objected to men being placed on the register under that classification unless they had served a proper apprenticeship. It was, however, contended by several members that providing a man had served an apprenticeship to some kindred trade—such as mechanical engineering—and had one or two years' electrical engineering experience, that it should qualify him to be classified as a wireman. It was resolved that the matter should be discussed further at the next meeting of the Registration Committee.

Electrical Contractors' Association and the C.M.A.—The hon. secretary of the Electrical Contractors' Association, Mr. Leonard G. Tate, has just issued to the members a statement regarding the result of the agreement with the Cable-Makers' Association. The latter has agreed to pay 5 per cent. rebate on the bulk buyings of members of the Association amounting to £94,000, although the minimum amount of £104,000 for the 16 months was not reached. The amount above mentioned was paid between August 10th, 1907, and December 31st, 1908, a total of 16⅔ months. For the purpose of allocating the rebate, the figures given in the individual contracts have been taken, namely:—

Under £250 for one year, or under £333 for 16 months	Nothing
Under £500 for 12 months, or under £666 for 16 months	2½ %
Under £2,500 for 12 months, or under £3,333 for 16 months	5 %
Under £7,500 for 12 months, or under £10,000 for 16 months	7½ %

In order to gain the above rebates under their individual contracts, members of the Electrical Contractors' Association must have entered into separate contracts with the individual cable-makers, but under the agreement all their purchases from the different cable makers are added together, and rebate is paid on the above scale. Further, with each individual cable-maker they would have had to make two separate contracts, one for Association cable, and one for non-Association cable, and to enable them to obtain the above rebates, they would have had to purchase the minimum amount of each class. Here, again, under the agreement, their purchases are bulked and treated as though they were all bought under the one contract. Naturally, this arrangement has proved of considerable benefit to a large number of members. In one case a member has bought from three different cable-makers, his purchases amounting to £1,237, £1,429 and £36 respectively. Under his contracts he would get 5 per cent. on the first two amounts, but nothing on the last amount, whereas, under the agreement he will obtain 5 per cent. on the last amount also. Again, another member has bought from five cable-makers, his purchases amounting to £338, £250, £139, £38 and £43 respectively. Under his contract he would be entitled to 2½ per cent. on the first amount only, if all of one class, whereas his bulk buyings amount to £808, on the whole of which 5 per cent. will be paid by the C. M. Association. In a third case, a member has bought from four cable-makers as follows:—£1,410, £264, £252 and £5. He would be entitled to 5 per cent. on £1,410, whereas he obtains 5 per cent. on £1,931, and many similar cases could be quoted. In addition to the actual rebates as pointed out above, there will be a sum of about £670 left over, and the central board of the E.C.A. has decided that this amount shall be divided, half to go to the funds of the Association, and the balance to be returned to the members in proportion to their buyings, so that an amount of approximately 7s. per cent. will be added to the amount earned by each member. The agreement is still in force, and the central board urges members to use their best endeavours to increase the membership, so that the year's return will be largely increased, thereby earning a rebate of 7½ per cent. instead of 5 per cent. Should this be done, from 1½ per cent. to 2½ per cent. of their buying could be returned to the members, over and above the rebates they would be entitled to. The advantage of membership is obvious, and the Association is to be congratulated upon the successful results of its efforts on behalf of the members.

Wireless Telegraphy and Meteorology.—A conference has just taken place at the German Ministry of Agriculture in Berlin, to consider a report by Dr. Polis, the principal of the Meteorological Observatory at Aix-la-Chapelle, on the subject of wireless telegraphy in the service of meteorology on the basis of his experience during a recent tour of investigation to the United States. The author submitted weather charts which were prepared during the journey over the ocean according to wireless telegrams from ships from the Continent. It is stated that the transmission of such messages was found to be free from difficulty up to a distance of 1,860 miles. In this connection telegrams from a point about the middle of the ocean required two complete days for transmission from ship to ship to Aix-la-Chapelle. Nevertheless, it was possible from the eastern part of the ocean to transmit telegrams up to distances of 372 miles to Aix-la-Chapelle in three hours, a matter which is of the greatest importance in Germany, as by this means a considerable extension of weather charts in a westerly direction appears possible. As a result of the conference, it has been decided, in order to gain full experience as to the extent to which news from the ocean can be made serviceable to practical meteorology in Germany, to organise in the ensuing summer when shipping traffic is more extensive than at present, a second period of experiments lasting over three months. The funds for the purpose will be provided by the empire and the Prussian Government.

The Electrical Trade Section of the London Chamber of Commerce.—The twenty-seventh annual meeting of the members of the above Chamber was fixed to take place yesterday (April 1st). The report of the Electrical Trade Section set out that Mr. C. P. Sparks had been re-elected chairman of the Section, and Messrs. W. L. Magden and C. H. W. Biggs, deputy-chairmen. The steps taken in regard to the electrical regulations in factories were detailed, and it was pointed out that as a result of opposition the draft regulations had been considerably amended. During the year the question of giving evidence before the Departmental Committee of the Treasury on the Fair Wages Clause in Government Contracts was considered, and efforts were made to secure a witness in the interests of electrical contractors. In view, however, of the fact that the Engineering Employers' Federation were arranging for evidence in this connection, it was considered that the views of the trade would be adequately brought before the Departmental Committee by that body. In addition, the Manufacturers' Section made a written communication protesting against any official interference with the rates of wages paid on contract work, and by this means the views of the Electrical Section were indirectly represented. Active opposition was continued throughout to the Coal Mines (Eight Hours) Bill, and although the measure passed into law, certain amendments were made which had the effect of minimising its scope. In conclusion, the report points out that many questions of general interest, formerly dealt with by the Section separately, are now covered by the Manufacturers' Section, in which many members of the Electrical Section are included.

Brown Cable Relay.—Mr. H. Savage writes to point out the following corrections to be made in the table given in our report of Mr. Brown's lecture on page 535: For "diameter of cable" read "diameter of copper"; for ·0864 ohm read ·0·864 ohm; KR should be $2{\cdot}41 \times 10^6$ and $2{\cdot}06 \times 10^6$, and the symbol mfd. should be omitted.

Football.—A recent match between the L.C.C. and Manor Thursday Football Clubs, played on the home ground at Peckham, resulted as follows: Manor Thursday, 5; L.C.C. Football Club, 2.

A match was played on Wednesday last between the L.C.C. Football Club and Mitcham Villa at Mitcham, with the following result: L.C.C., 3; Mitcham Villa, 1.

Electric Shock Fatality.—It is reported that on Saturday last an electrician named G. H. Smart, while at work on the roof of a motor-car shed at Callender's cable works, Belvedere, came into contact with a live wire, receiving a shock, which caused him to fall 12 ft. to the ground. When picked up he was dead.

Appointments Vacant.—Shift engineer for the Elland U.D.C. Deputy electrical engineer for Erith U.D.C. (£180). See our advertisement pages to-day.

Institution and Lecture Notes.—Institution of Electrical Engineers (Manchester Section).—The annual meeting of the Manchester Section was held on March 23rd, Mr. S. J. Watson, vice-chairman, presiding. The usual votes of thanks were passed, and the following were elected for the ensuing year:—Chairman, Mr. S. J. Watson; vice-chairman, Mr. J. S. Peck; committee, Messrs. Beaver, Bowman, McCowan, Cramp, Day, Fleming, Heap, Layton, Pearce, Rosenberg, Schwartz, and Taite; past chairmen (ex officio), Messrs. T. L. Miller, M. B. Field and Miles Walker. The secretary read the report of the Committee, which stated that during the session 11 meetings had been held. The number of members at the close of the session was 776 (including 310 students), as compared with a total of 787 last year. The Students' Section had held 10 meetings.

On the 17th ult. Mr. B. S. Cohen gave a lecture on "The Study of Telephonic Transmission in a Scientific Manner" before the Blackburn Telephone Society.

Royal Institution.—In the list of lecture arrangements for after Easter we observe the following:—Prof. W. E. Dalby, "Two Lectures on a Modern Railway Problem: Steam *v.* Electricity." The Friday evening meetings will be resumed on April 23rd, when Mr. Alexander Siemens will deliver a discourse on "Tantalum and its Industrial Applications." Succeeding discourses will probably be given by Prof. J. A. Fleming, Prof. Sir James Dewar and other gentlemen.

An interesting lecture on "High Tension Electricity" was recently given before the members of the Windsor and Eton Scientific and Archæological Society by Mr. J. G. Everett.

Coventry Engineering Society.—A lecture upon "Magnetos" was given on March 26th by Mr. A. E. Bennett (Bosch Magneto Co.), which led to an entertaining discussion and a variety of questions. Replying to the latter, the author said the life of the magneto entirely depended upon the way it was fitted, not so much the way it was used. The way to make it have a long life was to have a keeper upon it all the time. The average life was two years, but he had known them last five years.

Rugby Engineering Society.—On Saturday last, by the courtesy of Messrs. Morris & Shaw, Ltd., 21 members of this Society visited the Birch Coppice Colliery, at Polesworth, near Tamworth. They were shown over the entire surface plant, as well as the workings underground to the coal face, by the manager, Mr. T. W. Allen, and his assistants. As the membership of the Society is mainly recruited from the British Thomson-Houston Co., Ltd., and Willans & Robinson, Ltd., the visit should prove of great practical value.

Association of Engineers in Charge.—On Saturday last the 14th annual dinner took place at the Holborn Restaurant; there were about 300 guests, and the chair was occupied by the President, Mr. J. Swinburne. After the loyal toasts, Sir W. H. White proposed the health of the Society, to the members of which he gave wise advice. In reply, Capt. H. Riall Sankey referred to the recent report of the Departmental Committee of the L.G.B. on Poor Law Institutions, and to the responsibility imposed upon engineers in charge of the machinery of such establishments.

Proposing the health of "Our President," Mr. A. Davey expressed the gratitude of his colleagues to him and to the vice-presidents for their valued sympathy and help. Mr. Swinburne, in reply, expressed his deep appreciation of the honour of being invited to act as president, and maintained that engineers as a rule did not take themselves seriously enough. England, he said, was one huge factory, to the working of which engineers were indispensable; yet the country was not governed by engineers, or in a way that would appeal to engineers. He drew a telling sketch of the evils of party Government as applied to the management of a limited liability company or an Atlantic liner, and suggested that engineers were too busy to take sufficient interest in public affairs; they were a very large and most important body, and should be able by degrees to put things in order.

Dr. R. T. Glazebrook, in proposing "Our Guests," referred to the indebtedness of the community to engineers, whose work was indispensable to modern civilisation. Mr. A. J. Walter replied, eulogising the devotion of the engineer to his profession—the secret of success—and said that engineers were apt to neglect the social side of life. It was high time that the status of the engineer in charge was recognised, and that he should be made the responsible head in his department.

Mr. A. E. Penn toasted the "Kindred Institutions," to which, he said, they were greatly indebted for encouragement and support. Mr. H. P. Boulnois replied, remarking that the report of the Departmental Committee was an honest endeavour to give to the engineer in charge the importance that his position entitled him to.

During the evening an excellent programme of music and song was performed.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the Electrical Review *posted as to their movements.*

Central-Station Officials.—The annual staff dinner in connection with the electricity department of the Croydon B.C. was presided over by Mr. Alex. Cramb (chief electrical engineer), the guest of the evening being the Mayor (Major J. E. Fox). The chairman, proposing "The Mayor and Corporation," regretted the illness of the chairman of the Lighting and Electricity Committee (Alderman D. B. Miller), whose absence was due to bronchitis. Alluding to the tramways and electricity undertakings, Mr. Cramb said that in Croydon they were considered on purely business lines, and trust was reposed in the staffs. Of course, in regard to electricity, it was impossible to show the lowest cost when the price of coal was so high compared with what it was in other parts of the country. Proposing "The Committee," the chairman referred to the reduction in price recently made to consumers, and the very appreciable diminution in revenue caused by the introduction of new current-saving lamps. This was an entirely new problem. They anticipated getting over the difficulty by encouraging the use electricity for cooking and other purposes. There was under consideration a scheme for charging private houses a fixed percentage on the rateable value and a low rate per unit. Councillor Betteridge also referred to the diminished revenue. Their balance would not be as great as last year, but in Mr. Cramb the committee felt they had a thoroughly good engineer, and he had their confidence; it was largely owing to his earnestness and persistence that the undertaking was in its present condition.

Pending the filling of the vacancy for engineer and manager at the Southwark electric light station, Mr. F. T. Wright, chief charge engineer has been given temporary charge.

Tramway Officials.—Mr. Reginald Orton, who is resigning the position of assistant engineer and manager to the Coventry Electric Tramways Co., to take up that of manager of the Douglas (Southern) Electric Tramways, Ltd., was on Friday presented with a solid silver rose bowl by the staff and employés of the Coventry Co. The presentation was made by Mr. T. R. Whitehead, manager, who wished Mr. Orton every success in his new position. Mr. Orton responded in appropriate terms.

At a meeting of the Johannesburg Town Council on March 3rd, it was decided to increase the salary of the tramway manager from £800 to £1,000 per year as from January 1st last.

General.—We read in the American *Electrical Review and Western Electrician* that, on the occasion of the anniversary dinner of the American Institute of Electrical Engineers, commemorating the 25th anniversary of the Institute, Mr. Frank J. Sprague, on behalf of the past-presidents of the Institute, presented to Mr. T. Commerford Martin a silver loving-cup, bearing on one side the following inscription:—

To T. Commerford Martin, Senior Past-President of the American Institute of Electrical Engineers. Presented March 11th, 1909, at the quarter centenary celebration of the founding of the Institute. In appreciation of 25 years of unselfish devotion to the best interests of the Institute and the advancement of the electric arts.

We regret to learn that Mr. G. Payne, Messrs. Willans and Robinson's outside manager for London and the South of England, met with a serious accident on Saturday evening last. In hurrying down the steps on to the platform in St. James's Park Station, he slipped and fell in front of an incoming electric train. Happily, he escaped contact with the live rail, but he sustained such injuries that his left arm had to be amputated at the Westminster Hospital, where he now lies.

Mr. Walter Crooke, of Middlesbrough, writes disclaiming responsibility for the letter signed "W. C." in our issue of March 12th.

Obituary.—We regret to learn of the death of Mr. W. P. J. Fawcus, M.Inst.C.E., M.I.E.E., which occurred on Sunday evening last, at 2, Queen Anne's Gate, S.W. For many years Mr. Fawcus was very intimately connected with electrical affairs in this country, and was well known and greatly respected by a large circle of friends. He had been associated as a director with various electrical and other manufacturing companies, among them being, until some few years ago, the Edison & Swan United Electric Light Co., the Altrincham Electric Supply Co., and Messrs. W. T. Glover & Co., Ltd. (of which he was a managing director), but at the time of his death he was a director only of Messrs. Crossley Bros., Ltd., of gas-engine fame. He has taken a lessened interest in electrical matters than formerly for about the past three years, having transferred his enterprising activities to an entirely different direction — namely, the agricultural and engineering development of large estates in East Africa, near Njoro, not far from Nairobi. He went out there in company with his wife and daughter, though the latter died in the course of the passage through the Red Sea, as was recorded in the Electrical Review at the time. Mr. Fawcus was greatly impressed with the future possibilities of East Africa, and in the estates in question he was jointly interested with Lord Hindlip. His large faith in this venture is well evidenced in the fact that his three sons, all of whom were in training for the overcrowded ranks of electrical engineering, left that profession in order to join him in his new ventures. Before his last journey to Africa, 18 months ago, Mr. Fawcus was operated upon in London, but unfortunately he had to return here again, landing in England just after last Christmas, to pass through a similar ordeal. The operation was a success, and everything seemed to point to his return to his newly-chosen work in June next; but the influenza epidemic, which has laid so many low of late, was on the watch for him, and that complaint was followed a week ago by pneumonia, which ended fatally. The deceased gentleman had been a member of Council of the I.E.E., and he will be remembered by many as one of the presidents of the old Northern Society of Electrical Engineers, now the Manchester Section of the I.E.E. He was electrical engineer to the Manchester Ship Canal at the time of its construction. Mr. Fawcus was only 46 years of age, a period of life when the majority of men (we refer to Englishmen, not Americans) have not much more than

begun to make their mark. It is deplorable that his career should have had such an untimely end.

Since the foregoing was written, "R.P.S." has sent us an appreciation of the late Mr. Fawcus, in the course of which he states:—

"Mr. Fawcus, who was educated at Wellington College, was one of the pioneers of the electrical industry in this country during the eighties. After serving his articles at Messrs. Hall's, of Dartford, he spent some years at the works of Messrs. J. I. Thornycroft & Co., Chiswick. In 1887, while engaged in the development of a new high-speed engine, he first turned his attention to the distribution of electricity for public purposes. He promoted a scheme for the lighting of Chester, and also established the Keswick Electricity Works—the first instance of the utilisation of water-power for public electricity supply in this country. These works were completed in 1889. Subsequently Mr. Fawcus joined the Manchester Edison & Swan Co. as managing director, and while with that company promoted and carried out the necessary contracts for the erection and equipment of the Altrincham Electric Supply Works. When this company was absorbed by the Edison & Swan United Electric Light Co. in 1898 he joined the board of the latter company. Mr. Fawcus belonged to a type which is, unfortunately, too rare in these strenuous days of acute competition, when the pressure of professional or business life engrosses almost the whole of men's time and attention. Work was to him not entirely an end in itself, as it is to so many men, but rather the means to an end—that of the wholesome enjoyment of life amid the companionship of his family and friends. A marked characteristic, which will be remembered gratefully by many, was the disinterested trouble he would take to assist others in their career or in difficulties of any kind."

CITY NOTES.

Llandudno and District Electric Tramway Construction Co., Ltd.

Mr. Stephen Sellon presided at Winchester House, E.C., on Monday over the annual general meeting of this company.

In moving the adoption of the report (see Electrical Review, March 26th, page 529), the Chairman said he was sorry to say they had had a bad year. The receipts had not come up to expectations consequent on the bad weather during the holiday season, and the fact that the Franco-British Exhibition took a lot of people away from watering places. The line, which should have been opened in the early part of the year, was not opened until June 6th, and consequently they had only had six months' working of the whole undertaking. He thought, having regard to that, the income showed well for the undertaking. One of the reasons why the construction time was extended was because of the deviation of the original line to Colwyn Bay; but he was glad to say the extension had been amply justified. They were now able to compare the working of the short line as compared with the working of the extension line since November 30th last, and he was glad to be able to say that the result had shown a 60 per cent. increase of traffic receipts. The public necessity for the linking up of Llandudno and Colwyn Bay was also shown by the fact that the average fare over the whole line during last year was 2¾d., which was a very high average for a tramway system. In consequence of the rush traffic in the busy weeks of the holiday season they proposed to add to their equipment. Their great difficulty was how to add to their receipts by a popular system of Sunday running. During the last summer he took the opportunity of airing this subject in the district, and an extensively signed petition by visitors was presented to the Councils concerned. Wales was very conservative in this matter, but they would continue the agitation, and he was hopeful of the result. The operative expenses, having regard to the cost of power, were very good. He had a very large experience in tramway undertakings, and thought the percentage of costs to receipts was exceedingly good. A difference of opinion had arisen as to whether they should pay 1½d. or 1d. per unit for power to the Llandudno District Council, and as it was an important matter to them they would shortly be in the Law Courts to have the agreement construed. Pending the placing of their finances upon a permanent basis, the board had not considered it advisable to recommend any dividend, but they hoped their arrangements would enable them to make an interim declaration during the current year. Owing to the necessity of making definite financial arrangements, and other reasons, they had decided to abandon the original proposition of transferring the undertaking when complete to a new company, and they therefore proposed before placing any debentures, that the borrowing powers of the company should be increased from £50,000 to £75,000, and that a change be made in the name of the company. The company was now a construction company, but there was no object in allowing it to remain so, as the constructive work was now almost complete. They had been in negotiation with the authorities in reference to the extension to Old Colwyn, and he believed that satisfactory terms could be arranged which would enable the order, which had been for some time before the Light Railway Commissioners, to be passed. They were satisfied with the growth of the Old Colwyn district, and were confident that the line would be a self supporting one itself and also act as a valuable feeder, especially if there had not to be payments to the local authorities. They had also negotiated for the working of the Great Orme Tramway, but for the present the negotiations had been abandoned. Now that the line was practically constructed the London administration would be placed on a more economical basis, and the whole of the work would be concentrated at Llandudno as far as possible. With regard to the balance-sheet, sundry creditors, which stood at £7,272, mainly represented the balance and retention to the contractors. The expenses of the loan, including the guarantee, had been added to the preliminary expenses, from which account they were proposing to write off a considerable sum. The cost of construction, which had gone up, was due to the extension of the Colwyn Bay line, which was ¼ mile longer than originally intended. The general expenses had been further charged with two items, viz. (1) £741, which was a penalty due to the Llandudno Council because they were behind the time for taking current; and (2) £300 which was a proportion of general expenses on account of a large amount of constructive work the board had in hand in the last year. So far as he could judge, they had at Llandudno a good little undertaking, which showed great promise for the future.

Mr. A. W. Tait, in seconding the resolution, said some questions had been raised as to his joining the board, in consequence of his connection with the board of another company. It was not his intention, however, to take part in any of the negotiations with regard to the settlement of the accounts with Messrs. Bruce Peebles and Co., the contractors.

Replying to a number of questions asked by Mr. St. John Roach and Mr. Berkheim, the Chairman said that, with regard to the retirement of two directors during the year, it was not in consequence of any dispute. As to the raising of the £75,000 debentures, this was, to a large extent, foreshadowed in the original prospectus. The articles allowed the directors to find £50,000, and all they asked for was to increase that sum to £75,000. One of the reasons for this was the contemplated extension to Old Colwyn, and another the provision of more cars and the putting down of extra feeders to supply these cars. There were other reasons for asking power to the board to raise the extra money if they needed it, which he would be pleased to communicate privately to any shareholder. It was true that they were unable to cope with the holiday traffic last year, and that there were delays, and the reason was that the Llandudno Council could not supply them with sufficient current to run the whole of the 14 cars. That would not occur next summer. Bruce Peebles were their contractors, and it was true they went into liquidation, and the contract was carried out by the liquidators. The contract was now finished, and they had nothing more to do with it beyond the settlement of details.

A Shareholder pointed out that apparently they had to pay £741 to the Llandudno Council because the tramways were late in completion, and consequently did not take current so soon. As it appeared that the Council could not supply them with sufficient current during the season, could that not be put as a set-off?

The Chairman said they could not do anything of that kind. All they could do was to give six months' notice of their further requirements.

The report was adopted, as were special resolutions authorising the board to raise £75,000 debentures, and to change the name of the company to the Llandudno and Colwyn Bay Electric Railway, Ltd.

Oriental Telephone and Electric Co., Ltd.—At the annual general meeting, to be held on April 28th, the directors will recommend (subject to final audit) a dividend at the rate of 6 per cent. per annum on the preference shares for the half-year ended December 31st last, less income-tax, and a final dividend of 5 per cent. on the ordinary shares, free of income-tax, making a total of 8 per cent. for the year. The transfer books will be closed from April 15th to 28th.

Direct United States Cable Co., Ltd.—Interim dividend of 4s. per share, free of income-tax (at the rate of 4 per cent. per annum) for the quarter ending March 31st, 1909, payable on and after April 26th.

Liverpool Rubber Co., Ltd.—The report for 1908 shows a credit at profit and loss account of £4,894, after deducting the adverse balance of £2,423 brought forward. £885 has been placed to special reserve, and dividends of 5 per cent. on the non-cumulative preference shares and 2 per cent. on the ordinary shares are recommended, carrying forward £1,326.

British Aluminium Co.—Meetings of the debenture stockholders in this company, and of the Loch Leven 5½ per cent. debenture-holders, were called for Monday last, to authorise the creation by the Loch Leven Water and Electric Power Co., of first mortgage debentures or debenture stock to an amount not exceeding £240,000, on certain conditions.

South Metropolitan Electric Light and Power Co., Ltd.—Warrants for interest on the 4½ per cent. first mortgage debenture stock for the half-year ended March 31st, 1909, have been posted.

Lancashire Dynamo and Motor Co., Ltd.—The *Financial Times* states that for 1908 this company made a net profit, after allowing for depreciation and debenture and other interest, of £11,742; £249 was brought forward. A final dividend of 5 per cent., making 7½ per cent. for the year, on the ordinary shares is recommended. The output has shown an increase, but results have been adversely affected by low competitive prices.

County of Durham Electrical Power Distribution Co.

The annual meeting of this company was held at Newcastle-on-Tyne on March 25th.

Dr. J. T. Merz, in moving the adoption of the report (see Electrical Review, March 12th, page 439), said that the connections to the company's system amounted to 29,336 H.P., an increase of 8 579. They estimated last year that the increase would be 11,898, but there was a deficiency of 3,320 H.P. Connections were being made slowly. They had been postponed largely owing to depression of trade. The lighting business had increased by 89 753 units, the increase in the previous year having been 142,000 units. The profit showed a considerable reduction on their estimate. It was only £1,211 more than in the previous year, the total having been £24,224 against £23,013. An estimate had been made that the profit might reach £38,000, but instead there was a difference of £13,000. The explanation of that was partly that there had been 3 300 H.P. less, and if they had had this they would have had £3 800 more profit. The yield on the connected horse-power had been very much less, there having been a decrease of 25 per cent. in the consumption. The capital expenditure of the company was £44,000 more. They had reduced loans by £12,000. During the first 12 weeks of this year the increased net profit had been £3,240 which worked out at £270 per week. This was largely due to the reduced price of coal. If this were continued throughout the year at the same rate it would mean a profit of £38,000 instead of £24,000. While he would not say that they would get this, if trade in the district improved, or continued as good as it was now, they would have a much larger profit than they had in the past year.

Mr. J. H. Armstrong seconded the motion.

A Shareholder remarked that the price of coal was now as low as it ever would be, and the Mines Eight Hours Act might cause it to go up considerably. He was afraid that if that were so it might affect the profits of that company.

The Chairman said they had not got to their lowest consumption of coal per horse-power. They were developing the use of the waste products from coke ovens, and in this way they hoped to get considerable advantage.

The report was adopted.

Newcastle-on-Tyne Electric Supply Co., Ltd.

Unusual interest attached to the twenty-first annual meeting of this company, judging from the very large attendance present at Newcastle on March 25th.

Dr. J. T. Merz presided, and in moving the adoption of the report (see Electrical Review, March 12th, page 442), he said that the connections showed an increase of 18,720 H.P., and the profit a reduction of £12,189. There were several items that had affected the profit of the company. One was the general depression of trade on the Tyne, and another was the stoppage which took place for a large portion of the year in the shipbuilding and engineering trades. They also spent more on repairs and maintenance of plant than in the previous year, which amounted to about £10,000. They had carried these repairs out when the works became slack. At such a time they had the opportunity of doing a good deal of that sort of work, which they could not do in time of pressure. Last year was the first that they had not been pressed to the very utmost, in fact, pressed almost up to danger point. Up to last year the company had not had many bad debts. They had been insignificant—something like from £100 to £200, which was very small considering their large turnover. There was a customer who had gone into liquidation, and who owed about £4,000. Although they did not consider this a bad debt, they had had to provide for it out of the profit of the company. So far as their lighting business was concerned, they sold 3,597,000 units, as against 3,423,000 sold in the year before, an increase of 174,000 units. The price of coal had again been heavy; in 1908 they had spent £17,500 more for coal, and in 1907 £13,000 more—or for the two years £30,000 more than they would have spent if the price had remained what it was in 1906. They had now made contracts for seven-eighths of their requirements of coal at a price nearly similar to that paid in 1906. The chairman, proceeding, said there was a series of special questions which had been asked partly in writing, and partly verbally, regarding the position of the company and the nature of its business during the year. The first was in relation to Dunston power station. There had been rumours going about that there was something wrong with the station. The work was progressing, and it was hoped that the station would be started at the beginning of next year. Considerable work had had to be done underground to the foundations, and difficulties had been met with. It was found wise not to do anything overground until the underground was finished and safe and secure. The work was now all finished, and the foundations were quite safe. They were now carrying out the structure without any change in the plans, and the plant would be put in when the time came for that to be done. He admitted that all delay in work was objectionable, but that could not be helped. As to the issue of shares last year, they did not issue them; they only sold the whole of the shares to the bank, and this was a contract for a certain price—a definite sale on their part, and the bank issued the shares to the public. Some shareholders thought their company was to blame because they made the issue at a time when trade in this district was in jeopardy. But the facts that they set forth at the time were correct, as, at the time, the profit of the company was about the same as the year before. They could not postpone making financial arrangements because they were largely in debt. They were indebted to the bank and to private persons to the extent of about £200,000. Had they not done what they did, they could not have gone on. The bank obliged them in order that they might liquidate the debt they were in, and the directors were bound in honour to fulfil their promise and pay off the debt and raise more capital as soon as they could. As the bank took over the whole of the issue, and with the full knowledge of all the facts, as to the state of business, and such like, they made the issue, with the result that the shares were all taken up, and the company got a premium which, after paying all expenses and other things, amounted to something like £10,000. There had been some alteration made in the statement of accounts. The shareholders were no longer given statements of total revenue and costs, for such figures were being constantly used against them to induce customers, such as collieries, to start their own plant. They did not want people to make their own electricity, and five or ten years later go to the company and ask them to do it. They wanted people to go to the company at once, as they could supply them more cheaply and better, and with greater safety and security than they themselves could produce it. The chairman concluded by stating that for the 12 weeks since January 1st this year, they were £8,000 better off than they were at this time last year. If they went on at the same rate as they had been doing for the remainder of the year, it was calculated that the net profit would be £102,000. He could not say whether they would or would not continue to go on as they had been doing for the first period of this year, it was for them to say whether the prospect of trade was improving or not.

Mr. J. H. Armstrong seconded the motion, and said he proposed to deal with the question of depreciation, as he knew there was a feeling of doubt in the minds of many of the shareholders as to whether their interests were being properly protected. He explained that the directors dealt with the company on the lines of a Parliamentary company with an interminable life, where the plant and system generally had to be thoroughly maintained. For the purpose of dealing with the question of depreciation, he allocated the capital expenditure as follows:—Acts, orders and lands, £88 041; foundations, buildings, tunnels, and similar works, £289,0.6; accumulators, £18,601; mains, £446,003; switchboards, stationary transformers, meters, &c., £331,919; machinery, boilers, turbines, motors, &c., £612,340; total, £1,785,980. As to Acts, land, &c., there was, of course, no depreciation, they rather increased in value, nor was there any depreciation in regard to foundations, buildings, &c., so long as they were maintained out of revenue. They paid, under a contract with the manufacturers of the accumulators, an annual sum for the maintenance, repair, and renewal of these. As to mains, their experience showed them that when once a properly laid cable was put to work, the faults that occurred were practically those caused by mechanical and other external damage, and when these did occur they were immediately replaced out of revenue. He contended that they were justified in concluding that the cable system could be amply maintained by the annual amount expended upon it. The reliability of supply necessitated daily supervision, and the keeping of all switchgear, transformers, &c., up to the highest possible standard, and this was done out of revenue. As to machinery—dealing with the rotating plant, he said it was absolutely necessary to keep that in full repair. The system which the company adopted, was:—Each year five or six turbines were entirely dismantled from end to end, and brought to the condition of new. Thus the turbines were, from the revenue-earning point of view, as good as when first installed, indeed, in some respects they were better. A similar method was adopted in regard to all other moving plant. They used exclusively the water-tube boiler, the deterioration of which was practically confined to the tubes, furnaces, and fittings. In every case in which tubes or furnaces had given trouble, they had been completely renewed. In proof of this, he pointed out that £37,000 had been spent on repairs, maintenance and renewals. The amount compared with a figure of £20,700 for 1907, and the increase was due to the increased size of their system, and to special improvements which the company made while the plant was not fully occupied owing to strikes. They would thus see that the directors had in no way reduced either the supervision or the expenditure on the upkeep of the undertaking, although the year had been a bad one. Of the £37,000 he had mentioned, over £23,800 represented entirely what might be termed renewals. In concluding, he dealt with the question of investments and the reserves in hand, mentioning that £150,000 had been written off the capital account as depreciation, while there were considerable amounts as balances on both the reserve and depreciation accounts.

Lord Joicey, speaking as a large shareholder, said he wished, after what he had heard, to express his entire confidence in the board of directors of the company. He had gone there, like a good many others, anxious to know why the dividend had become so much less. After the explanation of the chairman, which was full, frank, able and clear, he (Lord Joicey) was perfectly satisfied that there was good reasons for the dividend being as it was. He was thoroughly convinced that the company was now in as sound a condition as at any period since it was formed.

The report and balance-sheet were adopted.

It was agreed that dividends of 5 per cent. on the preference shares, and 2½ per cent. on the ordinary shares, be paid, all less income-tax.

Rio de Janeiro Tramway, Light and Power Co., Ltd.—According to the newspaper Press, this company has acquired control of the Jardim Botanico Co.'s tramway system, the only important independent tramway system now operating in the City of Rio de Janeiro and supplying an extensive service to the south-eastern district of that city.

Woking Electric Supply Co., Ltd.

The annual report to December, 1908, shows a total revenue of £14,504. Generation and distribution and management costs were £7,238, leaving £7,266, plus £565 brought forward. Out of this £7,831, debenture interest (4½ per cent.) absorbs £2,077, interest on temporary loans £255, 6 per cent. dividend on the preference shares £1,984, and 5 per cent. dividend on the ordinary shares £1,028. There has been placed to depreciation fund £1,500, and after sundry small amounts have been placed to reductions in various directions, £707 remains to be carried forward. The following table of progress is given:—

	Number of consumers.	Lamps connected.	Revenue.
1906	1,003	40,030	£12,296
1907	1,109	45,305	£14,131
1908	1,225	51,070	£14,453

During the year there has been issued £30 4½ per cent. debenture stock, and £1,438 6 per cent. cumulative preference shares. Owing to the rapid and continuous growth of the business of the further debenture stock, preference and ordinary shares may soon be issued. The expenditure on capital account stands at £116,550. During 1908 17 miles of cable have been laid down, the major portion of it being in Bisley, Addlestone and Chertsey. The Board of Trade has granted an Extension Provisional Order for the increase of the company's area to include Laleham, Littleton, Thorpe, Cobham, Wisley, Ockham, Send and Ripley, and Pirbright. The following is a statement of electricity generated, sold, &c.:—

Units generated..	845,916
Quantity sold	619,818
Used on works	26,708
Quantity accounted for	646,521
Estimated lost in transformers	157,680
Unaccounted for	41,715
Total supply demanded, kw.	509

Edwards Air Pump Syndicate, Ltd.

The report to December, 1908, refers to the serious depression in all branches of engineering, but in spite of adverse conditions, the directors are able to recommend a final dividend at the rate of 10 per cent. per annum, making, with the interim dividend, 15 per cent. for the year.

As the reserve fund for redemption of patents now stands at £15,000, which equals the amount originally paid for the patents, the directors deem it unnecessary to further augment this fund, but they have set aside an additional sum of £500 to allow for any possible depreciation in investments, bringing the investment reserve account up to £1,240. The dividend equalisation fund stands at £1,000 as before. The total number of pumps booked during 1908 was 792, as compared with 1,208 during 1907. Of this number 434, or 55 per cent., were for land installations, and 358, or 45 per cent., for marine work. The Royalty income for 1908 amounted to £6,288. Of this sum £1,081, or 17 per cent., was received from foreign countries. The ordinary expenditure for the year was £2,933. The Edwards pump has now been fitted to more than 450 of the principal electric lighting and traction stations in this country and abroad.

The directors in their report give a list of Governments, corporations, boards, and companies by whom the pumps were ordered during 1908. The gross revenue for the year was £6,887, and the working expenses were £3,161, leaving a gross profit of £3,726, plus £578 brought forward. There has been set aside for investment reserve account £500, to bad debts £309, and to depreciation £6. After paying dividend as above there is carried forward £285.

Mersey Railway Co.

Mr. James Falconer, M.P., presided on Tuesday at Worcester House, Wallbrook, over the half-yearly meeting of the above company.

In moving the adoption of the report (see Electrical Review, March 26th, page 520), the Chairman said the accounts of the half-year showed continuous progress on the part of the company, both as regarded its receipts and as regarded the number of passengers carried. If they took the whole of 1908, and compared it with 1909, they found their total receipts were £103,877, as compared with £100,919, an increase of £2,958. Having regard to the fact that during the whole of the year there had been great dulness of trade in the districts which they served, they had reason to be satisfied with the amount of progress which had been made during the year. All other undertakings in the neighbourhood had, he believed, had substantial decreases in their revenue. Perhaps their company was more dependent upon good trade than any of them, and the fact that they had been able, under these circumstances, to make substantial progress, showed that more and more their undertaking was serving the great public purpose for which it was originally designed. There was no other explanation of the progress except the fact that through the increased facilities which they continued to give to the districts which they served, the Cheshire side of the Mersey was becoming more popular and gradually becoming developed. Also it was the case that people living on the Cheshire side were, in consequence of that efficient service, travelling more frequently than they used to do. The increase in their passengers was mainly due to the increase in the number of season ticket-holders, which was very satisfactory. Comparing the half-year to the end of 1908 with the corresponding period of 1907, their total receipts were £52,193 against £51,027. Of course, the real measure of their progress must always be from the point at which they adopted electric traction. In the last half-year which they worked with steam, which ended December 31st, 1902, the total number of passengers carried, including season ticket-holders calculated at the usual rates, was 3,357,688, whilst during last half-year the number was 6,874,438, an increase of 3,500,000, or 104 per cent. It was, of course, very unwise to prophesy as to the future, but he saw no reason, if they continued to give the best possible service and accommodation to passengers, why they should place any limit on development, because the more people there were in one of these suburbs the more likelihood was there of other people going there. Undoubtedly they had a long way to go before any reasonable return was got upon the capital which was sunk in the undertaking, but when they looked back on their experience since adopting electric traction, they had encouragement to continue on that line of policy which had been adopted of giving the best possible service in the hope of the districts developing. Following out that policy during the half-year, they had substantially improved their service. Their expenses during the half-year had been £37,699 against £37,308, an increase of £391. The board were satisfied that they had now reached a service which would be sufficient for a very large increase in their traffic if it came, and they did not look forward to any substantial increase in the working expenses. They were hopeful that in the future practically all the increased receipts would mean increased net revenue.

Mr. R. Cooper seconded the motion.

Replying to a Shareholder, the Chairman said the board would sell their motor-'buses if they had a fair offer, as it was entirely a question of price. He did not fear a glut in the market of these 'buses, because the poorer 'buses were being cleared away, and their 'buses were amongst the best in the market.

The motion was adopted.

Salisbury Electric Light and Supply Co., Ltd.

The directors' report for 1908 states that the generating plant has been sufficient to meet the output, and the whole of the plant is in thorough working order and capable of dealing with a considerably increased demand. The profit on the year's working, including £335 brought forward, amounts to £5,157, and after paying £1,433 interest on debentures and interim dividend at the rate of 4 per cent. for the half-year, amounting to £700, there remains a balance of £3,024. The directors recommend that a further dividend at the rate of 7 per cent. for the half-year be paid, making with the interim dividend, 5½ per cent. for the year, and that £1,500 be carried to reserve, leaving £299 to be carried forward. The directors record the death of Mr. William Pinckney. The vacancy on the board has been filled by the election of Mr. A. C. Bothams. The following is a statement of electricity generated, sold, &c.:—

Units generated	617,495
Sold:—Public lamps	10,200
Private consumers by meter	502,846
Total sold	513,046
Used on works	56,366
Total used	569,412
Expended in distribution	84,083
Public lamps	33
Total maximum supply demanded, kw.	314

Bromley (Kent) Electric Light and Power Co., Ltd.

The directors state that satisfactory progress had been made by the company during the year 1908. The lamp connections have increased from 77,802 to 84,052, and the sale of current from £15,238 to £15,752. The works have been maintained in good order and repair. During the past year an additional distributing station has been erected at Elmstead, and it is now in operation. The result of the year's trading, including £308 brought forward, shows a profit of £12,563, and after payment of debenture interest and trustee's fees, amounting to £3,202, there is a balance of £9,360. An interim dividend at the rate of 4 per cent. per annum was paid for the half-year in October, and the directors recommend a further dividend for the second half-year at the rate of 7 per cent. per annum, making a total dividend of 5½ per cent. for the year, and that £2,338 be placed to reserve account for renewal of plant, and £2,600 to general reserve fund, leaving £297 to be carried forward.

Manufacturing in Italy.—The report of the Tecnomasio Italiano Brown-Boveri, of Milan, which is closely associated with the Swiss firm of the latter title at Baden, states that in consequence of the crisis the prices of electrical machinery were depressed during 1908, but notwithstanding this, financial results were obtained equivalent to those in the preceding year. In the case of the Tecnomasio itself, the orders received advanced from a value of £176,000 in 1907 to £224,000 last year, but the Italian contracts destined for the Baden works declined from £116,000 to £16,000 in the same years respectively. The value of the orders on hand at the beginning of 1909 was £152,000, as compared with £96,000 at the commencement of 1908, the former including four alternators of 5,000 H.P. each, four of 6,000 H.P. each, and three of from 10,000 to 12,000 H.P. each, the last being for the city of Milan's works at Grossotte in the Veltlin. The report adds that after acquiring the works of the firm of Gadda, the work of manufacturing was removed to them. The net profits, which amounted to £3,700 in 1907, rose to £14,800 last year, and a dividend of 6 per cent. is proposed on a share capital of £240,000, this contrasting with a similar rate paid on capital of £180,000 in 1907.

Mexican Electric Light and Power Co., Ltd.—A dividend of 1 per cent. on the ordinary shares is announced.

Willans & Robinson, Ltd.

The accounts for the half-year ended December 31st, 1908, show that as regards Rugby, after writing off £9,625 as depreciation, there is a profit of £14,045. As regards Queen's Ferry, there is a net loss in respect of the trading operations preparatory to closing the works, and in completing contracts, of £825. This figure covers proportionate contributions to debenture interest and directors' salaries. The net profit for the half-year is, therefore, £13,220, and the total amount available for distribution or otherwise, including £8,047 brought forward from last half year, is £21,266. The directors propose to pay a dividend at the rate of 6 per cent. per annum upon the preference shares, absorbing £9,999 18s.; and to apply £1,750 partly in paying interest upon and partly in redeeming funding certificates, in accordance with the approved scheme. In view of the unfavourable prospects of business, the directors do not feel justified in recommending the payment of a dividend upon the ordinary shares upon the present occasion. They recommend instead, that the balance of the half-year's profit (£1,470) be added to the amount carried forward in the profit and loss account, raising it to £9,517. The business outlook, which at the time of the last report was extremely unfavourable, has undergone no improvement. The continued restriction of enterprise in this country has checked the demand for the company's manufactures, and at the same time has enhanced competition among makers, and has reduced the margin of profit. Owing to improved organisation and methods of work, the company's output for the half-year has been greater than for some years past, but orders are not coming forward so freely as before to replace those completed. Although every effort is being made both to effect economies and to develop the business upon new lines, it has recently become necessary to run the works upon reduced time, though it is hoped that this may be required only for a short period. It may reasonably be anticipated that the causes at present adversely affecting the company's business are not of a permanent character, and that the prospects of an early recovery of prosperity, which until recently appeared very bright, are only postponed for a short period. The directors have not yet succeeded in disposing of the lease and premises at Queen's Ferry, but the surplus plant, other than that which it was expedient to retain for sale with the buildings, has been sold by auction at prices which compare favourably with the auctioneers' valuation. The direct annual charges for the Queen's Ferry Works, until they are finally disposed of, will in future amount to a comparatively small sum, chiefly for ground-rent and up-keep. The directors record the death, in November last, of Lieut.-General Sir R. H. Sankey, K.C.B., R.E., one of the two trustees for the debenture stockholders. The directors have appointed Mr. Mark H. Laskey to fill the vacant position, and the debenture stockholders have been invited to approve the appointment. The directors unanimously recommend the election of Mr. Leslie S. Robertson, M.Inst.C.E., as an additional ordinary director at £400 per annum. Mr. Anderson desires that, with the close of the work in connection with Queen's Ferry, his remuneration should be reconsidered. His colleagues are of opinion that £400 per annum would be a suitable remuneration for Mr. Anderson's services at Rugby, and a resolution will be proposed accordingly.

Accompanying the report there has been sent to the shareholders a circular stating that symptoms of ill-health from which Mr. Mark Robinson has long suffered intermittently have become so pronounced that he no longer feels able to face the strain which his duties place upon him. Mr. Robinson has rendered the firm 28 years' service, and he wishes to be at once relieved from his duties instead of serving the remaining two years to which his election in April last entitles him. The two directors who sign the circular (Messrs. G. W. Anderson and J. C. Peache) say that the least sum that they think can with fairness be named as compensation is one year's salary, viz., £2,653. A resolution will be put to the forthcoming meeting on Tuesday, April 6th, authorising the payment of such sum to Mrs. Robinson or to trustees on her behalf.

Electric Distribution of Yorkshire, Ltd.—Mr. A. G. Lupton presided on Tuesday last week at this company's meeting. It was stated that the Ossett Corporation's electric light order had been taken over and a sub-station erected at Ossett: mains had been laid, and early in November last a supply was commenced to the tramways running in Ossett and Soothill Nether. The result of the increased revenue had been a gross profit of £37 after paying all expenses, and after the sum of £23 11s. had been deducted for interest allowed on calls paid in advance a net profit of £13 was left, which is carried forward. The directors congratulated the shareholders on this result, and were of opinion that the results for 1909 would be considerably better. Only £4,611 had been expended on property of the company, and the results shown in the profit and loss account had been achieved on this small outlay. Any further capital subscribed would be spent on directly remunerative assets. The money would be carefully expended on consumers whose estimated revenue would show a satisfactory return. An increase of the issued capital would soon bring the company into a good dividend-paying position. The report was adopted.

River Plate Electricity Co., Ltd.—The report for 1908 shows, after providing for debenture interest and all depreciations, a credit balance of £21,813, plus £5,410 brought forward, making £27,223. The full dividend of 6 per cent. upon the preference shares, £6,000, and a dividend of 8 per cent. on the ordinary shares, as against 6 per cent. last year, are proposed. £6,000 is added to general reserve, and £5,623 is carried forward.

Madras Electric Tramways (1904), Ltd.

The annual meeting of the above company was held at Dashwood House, E.C., on Thursday, March 25th. The meeting was held in private.

The following report was formally proposed and adopted:—The accounts for the year ended December 31st, 1908, show a gross profit of £11,325 plus £221 brought forward, making £11,546. After debiting interest and London office expenses, making provision for the debenture stock sinking fund, and transferring £2,750 to the depreciation and renewal fund, there remains a balance of £3,774. The dividend of 4½ per cent. per annum on the preferred ordinary shares (whereof a moiety was paid on September 30th) absorbs £2,587, an additional dividend of ½ per cent. per annum on the preferred ordinary shares out of the surplus profits for 1908 absorbs a further £288, and a dividend of 1 per cent. per annum on the deferred ordinary shares is paid, requiring £573, and leaving a balance of £326. This is divided as follows:—Balance of surplus profits for 1908, belonging to the preferred ordinary shares, carried to surplus dividend account £34, leaving to carry forward £192. The traffic continues to develop satisfactorily, the gross receipts for 1908 showing an increase of 7·05 per cent. upon 1907. The undertaking has been thoroughly maintained out of revenue, and special improvements and renewals have been debited to depreciation and renewal fund. The reserve available from the debenture stock sinking fund now amounts to £1,718.

Anglo-Argentine Tramways Co., Ltd.—The balance to the credit of revenue account for 1908, including £16,734 brought forward, as well as a sum of £7,125 for interest received on La Capital Traction and Electric Co. debentures owned by this company, and after crediting £48,000 to depreciation renewals fund (a total of £136,746 having been expended on ordinary maintenance out of a revenue during the year) amounts to £490,888, from which the following appropriations have been made:—Debenture interest and sinking fund, 6 per cent., £16,641; debenture interest and sinking fund, 4 per cent., second half-year, £12,664; annuity paid to "City" Co., £70,660; interest on debentures for the second half-year, Buenos Ayres Electric Tramways Co. (1901), £7,181; dividend on the first cumulative preference shares, 6 per cent. per annum, £78,002; dividend on the second cumulative preference shares, 10 per cent. per annum, £160,000; dividend on the third cumulative preference shares, 5 per cent. per annum for second half-year, £37,500; sinking fund for the redemption of the preference and ordinary shares, £6,300; total, £388,949, leaving a balance of £101,939. Out of the foregoing balance there have been paid the following amounts:—£30,250, being the final payment of interest (to June 30th, 1908) on the purchase money of the Buenos Ayres and Belgrano Tramways, £2,100 voted to retiring directors, and £8,000, being dividend on 40,000 ordinary shares for the half-year to June 30th, at the rate of 8 per cent. per annum. The directors now recommend a dividend on the 300,000 ordinary shares issued on July 1st for the half-year ended December 31st, at the rate of 6½ per cent. per annum, free from income-tax, which will absorb £48,750, leaving £12,839 to be carried forward.

Stock Exchange Notices. — The Committee has appointed special settling days as under:—

Tuesday, April 6th.—Anglo-Argentine Tramways Co., Ltd.—Further issue of £2,133,125 4 per cent. debenture stock (bearing interest from February 1st, 1909).

Wednesday, April 7th.—Anglo-Argentine Tramways Co., Ltd.—Scrip, fully-paid, for a further issue of £1,354,319 4 per cent. debenture stock.

And ordered the above and the following to be quoted in the Official List:—

Anglo-Argentine Tramways Co., Ltd.—Further issue of £413,220 4 per cent. debenture stock, in lieu of the permanent 6 per cent. debenture stock now quoted.

National Telephone Co., Ltd.—Further issue of £267,000 4 per cent. debenture stock.

Telegraph Construction and Maintenance Co., Ltd.—£140,000 4 per cent. debentures, within Nos. 1 to 1,463 of £100 each, in lieu of the debentures due January 1st, 1909.

Applications have been made to the Committee to allow the following to be quoted in the Official List:—

Johnson & Phillips, Ltd.—5 per cent. first mortgage debenture stock.

Lymington Electric Light Co., Ltd.—The annual general meeting of this company was held at the supply station on March 24th, Mr. Keppel Pulteney presiding. The directors reported satisfactory progress during the year, the result of trading, including £154 brought forward, showing a net revenue profit of £1,594. After paying interest on debentures and loans amounting to £586, £1,008 remained, out of which the directors recommended that £500 be placed to reserve account; preliminary expenses, £58, are written off, and a dividend at the rate of 5 per cent. is to be paid on the preference shares, leaving a balance of £130 to be carried forward. The chairman said the management had been very efficient, as was shown by the large decrease in the cost of fuel. On the capital account only £137 had been expended, and they had earned an increase of net revenue of £147. The directors had decided to discontinue free wiring. The reserve fund now amounted to over £1,100. The report was adopted. Mr. F. E. Gripper was re-elected a director.

Stewart & Lloyds, Ltd.—The capital is to be increased to £2,250,000 by the creation of 850,000 deferred shares, and the existing ordinary shares are to be known as preferred ordinary shares.

Cuba Submarine Telegraph Co., Ltd.—Dividend for the half-year ended December, 1908, on the ordinary shares, at the rate of 6 per cent. per annum.

MARKET QUOTATIONS

Wednesday, March 31st.

CHEMICALS, &c.		Latest Price.	Fortnight's Inc. or Dec.
a Acid, Hydrochloric	per cwt.	5/-	..
a ,, Nitric	,,	22/-	..
a ,, Oxalic	,,	28/-	..
a ,, Sulphuric	,,	5/6	..
a Ammoniac, Sal	,,	42/-	..
a Ammonia, Muriate (crystal)	per ton	£88 10	..
a ,, ,,	,,	£90	..
a Bleaching powder	,,	£5 10	..
a Bisulphide of Carbon	,,	£18	..
a Borax	,,	£16	..
a Copper Sulphate	,,	£20	..
a Lead, Nitrate	,,	£23 10	..
a ,, White Sugar	,,	£23 10	..
a ,, Peroxide	,,	£82	..
a Methylated Spirit	per gal.	2/6	..
a Potassium, Bichromate, in casks	per lb.	3½d.	..
a Potash, Caustic (75/80 %)	per ton	£20	..
a ,, Chlorate	per lb.	3½d.	..
a ,, Perchlorate	,,	9d.	..
a Potassium, Cyanide	,,	7d.	..
a Shellac	per cwt	77/-	..
a Sulphate of Magnesia	per ton	£4 10	..
a Sulphur, Sublimed Flowers	,,	£6 10	..
a ,, Recovered	,,	£5 10	..
a ,, Lump	,,	£5	..
a Soda, Caustic (white 70 %)	,,	£10 15	..
a ,, Chlorate	per lb.	3½d.	..
a ,, Crystals	per ton	£3 5	..
a Sodium Bichromate, casks	per lb.	8d.	..
a ,, Cyanide (basis 100 %)	,,	7d.	..
METALS, &c.			
b Aluminium Ingots, in ton lots	per ton	£70	..
b ,, Wire, in ton lots	,,	£112	..
b ,, Sheet, in ton lots	,,	£120	..
p Babbitt's metal ingots	,,	£50 to £135	..
c Brass (rolled metal 2' to 12' basis)	per lb.	7⅛d.	⅛d. inc.
c ,, Tube (brazed)	,,	8⅛d.	⅛d. inc.
c ,, ,, (solid drawn)	,,	7⅛d.	⅛d. inc.
c ,, Wire, basis	,,	6⅞d.	⅛d. inc.
c Copper Tubes (brazed)	,,	9⅝d.	⅛d. inc.
c ,, ,, (solid drawn	,,	9⅜d.	⅛d. inc.
g ,, Bars (best selected)	per ton	£71	£2 inc.
g ,, Sheet	,,	£71	£2 inc.
g ,, Rod	,,	£71	£2 inc.
e ,, (Electrolytic) Bars	,,	£69	£1 inc.
e ,, ,, Sheets	,,	£75 10	£1 inc.
e ,, ,, Rod	,,	£68 10	£1 inc.
e ,, ,, H.C. Wire	per lb.	7$\frac{9}{32}$d.	$\frac{1}{32}$d. inc.
f Ebonite Rod	,,	3/3	..
f ,, Sheet	,,	3/-	..
n German Silver Wire	,,	1/6	..
h Gutta-percha, fine	,,	5/6 to 6/6	..
h India-rubber, Para fine	,,	5/3	..
i Iron Pig (Cleveland warrants)	per ton	47/-	1/- inc.
l ,, Wire, galv. No. 8, P.O. qual.	,,	£14	..
g Lead, English Ingot	,,	£14	10/- inc.
m Manganin Wire No. 28	per lb.	8/-	..
g Mercury	per bot.	£8 7 6	..
d Mica (in original cases) small	per lb.	6d. to 1s.	..
d ,, ,, ,, medium	,,	2/6 to 4/-	..
d ,, ,, ,, large	,,	4/6 to 8/6	..
p Phosphor Bronze, plain castings	,,	1/- to 1/1	..
p ,, ,, rolled bars & rods	,,	1/1½ to 1/3	..
p ,, ,, rolled strip & sheet	,,	1/2½ to 1/6	..
o Platinum	per oz.	100/-	variable.
e Silicium Bronze Wire	per lb.	9½d.	..
r Steel Magnet, in bars	per ton	£55	..
g Tin, Block (English)	,,	£134 10 to £135 10	£5 inc.
n ,, Wire, Nos. 1 to 16	per lb.	1/8½	½d. dec.
p White Anti-friction Metals:—			
"White Ant" brand	per ton	£35 to £60	..
k Zinc, Sh't (Vielle Montagne bnd.)	,,	..	..

Quotations supplied by—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d F. Wiggins & Sons.
e Frederick Smith & Co.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Till & Co.
i Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
m W. T. Glover & Co., Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p The Phosphor Bronze Co., Ltd.
r W. F. Dennis & Co.

Demerara Electric Co.—The annual general meeting was held recently, at which the accounts to December 31st, 1908, were submitted. The gross tramway, light and power revenue was $127,051, an increase of $4,246 over the previous year. Outstanding bonds were $26,041. Out of the surplus a fund of $2,980 had been created towards the redemption of the second mortgage bonds, and there is a renewal fund in hand of $23,151. The net earnings were $26,041. The working expenses absorbed $70,824, and interest on the bonds $30,150.

Greenock and Port Glasgow Tramways, Ltd.—In the course of their annual report it is pointed out by the directors that in common with other shipbuilding centres, Greenock had during the past year suffered from abnormal depression in trade, with the result that the tramway receipts had fallen to a lower level than in any year since the present lines had been worked by electric traction. The outlay on electrical construction amounted to £1,092, making a total expenditure thereon of £194,734. The total revenue for the year was £27,736, and the expenditure £23,720, leaving a balance of £4,016. The directors recommend a dividend of 3 per cent. on preference shares. The number of passengers carried during the year was 5,857,978, compared with 7,670,456 in 1907.

STOCKS AND SHARES.

Tuesday Afternoon.

Peace having "broken out" in the Near East, the Stock Markets developed all-round strength. A burst of buying in all the active departments lifted prices substantially higher last Monday, and the improvements have been fairly well maintained. The prevalence of a good-sized bear account in a great many sections of the Stock Exchange was of material assistance in raising prices to a better standard.

Money, moreover, is so easy in Lombard Street that a reduction in the Bank rate is confidently expected very shortly, and it would cause no surprise were the change to come about this week. At present 3 per cent., the official minimum will, it is thought, drop by two stages to 2 per cent., and remain at that light charge until the autumn brings the usual demand for gold.

Electrical issues, it must be confessed, are lagging behind in the general advance in securities. A few of the railway stocks improved, in sympathy with the better tone which the change in the political outlook caused amongst Home Rails, and the speculative tramway-light-power shares and bonds have hardened. In the other divisions, however, alterations are comparatively trifling, and not all come on the upward side.

Supply stocks and shares are extremely quiet. Chelsea shares, Charing Cross Ordinary and Preference are duller, but there is a stronger sentiment for provincial companies' shares. Hove shares are up a further 5s., County of Durham Electrical Power Ordinary are an equal amount to the good, and Newcastle-on-Tyne shares appear to have come to an end of their recent flatness, the Ordinary shares rallying 10s. to 4½, and the Preference ⅛ to 5½. South London are ⅛ harder.

Mexican Light and Power Common shares are 2½ better, and the bonds show a rise of ⅝. Canadian General is rather easier at 108, the 7 per cent. Preference being 115. Shawinigan capital stock has been done at 97 this week, and the 4½ per cent. Perpetual Debenture stock (dividends due May and November) at 98.

On the cheerfuller tone all round, Rio Trams rose 2 to 102, and Mexico Trams at 137 are equally better. British Columbia Electric Railway Deferred has risen. Apart from these, the Colonial and foreign traction department is featureless. The Anglo-Argentine Tramways dividend had no effect on the price. London United Tramways issues continue to suffer from the fall in the dividend on the preference shares. Metropolitan Electric Trams have been unmoved by the declaration of a 4½ per cent. dividend on the ordinary shares, the price of which is 15s. middle.

British Electric Tractions fell further, as regards the Preference and the First Debenture. The issues have few friends, even at the present reduced quotations.

The news from Austria-Servia, added to the springlike weather, made Home Railway stocks quite buoyant, but the movement hardly got so far as electrical descriptions. Sunshine is, of course, an enemy to tubes and a supporter of open-air routes; but City and South London again advanced ½, and Metropolitan Consolidated more than recovered the loss of last week. Districts have enjoyed the usual slender spurt which falls to their share just before the Boat Race. The hour of starting may prejudice part of the traffic this week, but if Saturday is a fine day, it is certain that the usual crowds will flock to their usual places on the riverside. Underground Railways prior lien bonds moved up ½ to 102.

Still uninteresting is the telegraph market. Amongst the few quotable changes is the loss of ⅛ in Eastern Extension shares. Eastern Ordinary stock rose 1 to 130½. Globe Ordinary gained ⅛; other shares of the Trust companies are without alteration. The telephone group is steady. Rises in American Telephone and Telegraph capital stock and collateral trust bonds were due to a swift boomlet in the American Railroad market. This led to Anglo-American Telegraph recovering after the stock had been weak. National Telephone Third Preference shares rallied, after being a shade weaker.

Flatness in British Aluminium shares is ascribed to the preparations which have been made in connection with the coming issue of debenture stock. Babcock & Wilcox shares drooped, but Vickers and Armstrongs have been better on the extension of the navy scare, and the vote of censure debate in the House of Commons last Monday, although the full amount of the rise was not maintained. Electric Construction Ordinary and Preference are lower. Efforts are being made to sell London Electrobus Ordinary shares at 13s. 9d., but the offer should be treated very discreetly.

Melbourne Tramway and Omnibus Co., Ltd.—A dividend of 4½d. per share has been declared for the quarter to March 31st.

Bank Rate.—The Bank Rate was yesterday reduced to 2½ per cent.

SHARE LIST OF ELECTRICAL COMPANIES.

TELEGRAPH AND TELEPHONE COMPANIES.

Present Issue.	NAME.	Stock or Share. *	Dividends for the last four years. 1906.	1907.	1908.	Closing Quotations Mar. 23rd.	Closing Quotations Mar. 30th.	Business done week ended Mar. 30th, 1909. Highest	Lowest.	Rise + or Fall —	Present Yield per cent. £ s. d.
25,000	Amazon Telegraph Co.'s shares, Nos. 1 to 25,000	10	Nil	Nil	Nil	2⅜ — 3⅛	2⅜ — 3⅛	..	..	..	Nil.
186,700	Do. do. 5 % Debs., Nos. 1 to 1,250 Red.	100	5 %	5 %	5 %	92 — 95	92 — 95	..	..	..	5 6 5
$131,551,400	American Telephone & Telegraph, Cap. Stock ..	$100	7½	8 %	8 %	132 —133	135 —136	134½	133	+ 3	5 17 8
$53,000,000	Do. Collat. Trust, 4% Bonds, 1 to 28,000 and 53,001 to 78,000	$1000	4 %	4 %	4 %	96 — 98	97 — 99	..	..	+ 1	4 0 10
598,180	Anglo-American Telegraph	Stock	3½%	3½%	3½%	£3 4s.	55 — 58	55 — 58	57	..	5 5 3
3,200,910	Do. do. do. 6 % Pref.	Stock	6 %	6 %	6 %	6 %	99 —101	99 —101	100½	99½	..	5 18 10
3,200,910	Do. do. do. Deferred	Stock	½	1⅜	1 %	8/-	13⅜ — 13⅝	13⅜ — 13⅝	18⅜	13	+ ⅛	2 18 9
50,000	Anglo-Portuguese Tel., 5 % Mort. Deb. Stock Red.	100	5 %	5 %	5 %	5 %	99 —100	98 —100	100⅛	..	..	5 0 0
44,000	Chili Telephone, Nos. 1 to 44,000	5	8 %	8 %	8 %	..	7⅞ — 8⅛	7⅞ — 8⅛	..	..	..	4 15 6
2,481,850	Commercial Cable Stng. 500 year 4 % Deb. Sk. Red.	Stock	4 %	4 %	4 %	4 %	86 — 88	86 — 88	..	..	..	4 18 0
16,000	Cuba Telegraph	10	5 %	5 %	6 %	..	7⅛ — 8⅛	7⅛ — 8⅛	..	..	..	6 6 4
6,000	Do. 10 % Pref.	10	10 %	10 %	10 %	10 %	16½ — 17½	16½ — 17½	..	..	..	5 14 3
12,981	Direct Spanish Telegraph, Ord.	5	4 %	4 %	4 %	4 %	8 — 8½	8 — 8½	..	..	..	5 14 3
6,000	Do. do. 10 % Cum. Pref. ..	5	10 %	10 %	10 %	10 %	8 — 9	8 — 9	..	..	..	5 8 1
80,000	Do. do. 4½ % Debs.	50	4½%	4½%	4½%	4½%	100 —102	100 —102	..	..	..	8 16 6
60,710	Direct United States Cable	20	4½%	4½%	4½%	4½%	12½ — 12⅝	12½ — 12⅝	12⅝	..	..	6 9 3
48,000	Direct W. India Cable, 4½ % Reg. Deb., 1 to 1,900, R.	100	4½%	4½%	4½%	4½%	100 —102	100 —102	..	..	..	4 8 3
4,000,000	Eastern Telegraph, Ord. Stock..	Stock	7 %	7 %	7 %	..	128 —131	129 —132	129½	128	+ 1	5 6 1
2,000,000	Do. 3½ % Pref. Stock..	100	3½%	3½%	3½%	..	85 — 87	85 — 87	86½	..	..	4 0 6
1,896,706	Do. 4 % Mort. Deb. Stock. Red. ..	Stock	4 %	4 %	4 %	4 %	103½ —105½	103½ —105½	105½	..	..	3 17 8
800,000	Eastern Extension, Australasia, and China Tele	10	7 %	7 %	7 %	..	12 — 12½	11⅞ — 12⅛	12½	11⅝	..	5 13 4
752,400	Do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	100 —102	100 —102	101½	..	..	3 18 5
200,000	East & S. Afric. Tel., 4 % Mt. Db. (Mauritius Sub.) 1 to 8,000	25	4 %	4 %	4 %	4 %	100½ —102½	100½ —102½	..	..	..	3 18 1
181,127	Globe Telegraph and Trust	10	5½%	5½%	5½%	..	10½ — 10⅝	10⅝ — 10⅞	10⅝	10⅜	+ ⅛	5 8 3
181,127	Do. do. 6 % Pref...	10	6 %	6 %	6 %	..	12¾ — 13⅛	12¾ — 13⅛	13⅛	12⅞	..	4 9 9
150,000	Great Northern Telegraph, of Copenhagen.. ..	10	24%	20 %	20 %	..	30 — 32	30 — 32	31⅞	..	..	6 5 0
14,000	Halifax and Bermudas Cable, 4½ % 1st Mort. Debs., within Nos. 1 to 1,900, Red.	100	4½%	4½%	4½%	4½%	100 —102	100 —102	..	..	..	4 8 3
17,000	Indo-European Telegraph	25	13 %	13 %	13 %	..	52 — 55	52 — 55	..	..	..	6 18 11
$41,380,400	Mackay Companies Common	$100	2 %	3½%	4 %	4 %	74 — 78	70 — 77 xd	..	..	..	5 3 11
$50,000,000	Do. do. 4% Cum. Pref.	$100	4 %	4 %	4 %	4 %	71 — 74	70 — 75 xd	..	..	..	5 6 8
894,190	Marconi's Wireless Telegraph	1	Nil	Nil	Nil	..	⅞ — ⅞	⅞ — ⅞	17/-	16/6	..	Nil
72,680	Monte Video Telephone Co., Ltd. Ord.	1	5 %	6 %	6 %	6 %	⅞ — ⅞	⅞ — ⅞	..	..	..	6 0 9
86,492	Do. do. do. 5 % Pref. ..	1	5 %	5 %	5 %	5 %	⅛ — ⅛	⅛ — ⅛	..	..	..	5 12 11
2,225,000	National Telephone, Pref. Stock	100	6 %	6 %	6 %	6 %	105½ -107½	105½ —107½ xd	106⅞	105½	..	5 11 7
8,725,000	Do. do. Def. Stock	100	5 %	5 %	6 %	6 %	116½ —118½	116½ —118½	118	116½	..	5 1 8
15,000	Do. do. 6 % Cum. 1st. Pref.	10	6 %	6 %	6 %	6 %	10½ — 11½	10½ — 11½ xd	..	..	..	5 6 8
15,000	Do. do. 6 % Cum. 2nd Pref.	10	6 %	5 %	6 %	6 %	10½ — 11½	10½ — 11½ xd	..	..	..	5 6 8
250,000	Do. do. 5 % Non-cum. 3rd P., 1 to 250,000	5	5 %	5 %	5 %	5 %	5⅝ — 5¾	5⅝ — 5¾ xd	5⅝	5½	..	4 8 11
2,000,000	Do. do. 3½ % Deb. Stock Red. ..	Stock	3½%	3½%	3½%	3½%	98 — 100	98 —100	98½	..	..	3 10 0
1,716,598	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	99½—101½	100 —102	100½	..	+ ½	3 18 5
179,813	Oriental Telep. and Elec. 1 to 171,504, fully paid ..	1	7 %	7 %	8 %	..	1⅝ — 1⅞	1⅝ — 1⅞	28/1½	..	..	5 17 3
50,000	Do. do. 6 % Cum. Pref...	1	6 %	6 %	6 %	..	1⅛ — 1⅜	1⅛ — 1⅜	..	..	..	4 16 0
99,100	Do. do. do. 4 % Red. Deb. Stock ..	100	4 %	4 %	4 %	4 %	88 — 90	88 — 90	..	..	..	4 8 11
99,400	Pacific & European Tel., 4 % Guar. Debs., 1 to 1,000	10	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..	3 18 5
11,889	Reuter's	8	5 %	5 %	5 %	..	7½ — 8½	7½ — 8½	..	..	..	4 17 7
99,100	Telephone Co. of Egypt, 4½ % Deb. Red.	100	4½%	4½%	4½%	4½%	99 —101	99 —101	..	..	..	4 9 1
3,083	Submarine Cables Trust	Cert.	6 %	6 %	6 %	6 %	127 —130	127 —130	..	..	..	4 12 4
120,000	United River Plate Telephone	5	8 %	8 %	8 %	..	6½ — 7	6⅝ — 7	6⅞	6⅝	..	5 14 3
40,000	Do. 5 % Cum. Pref., Nos. 1 to 40,000	5	5 %	5 %	5 %	5 %	4⅞ — 5⅜	4⅞ — 5⅜	..	..	..	4 13 0
80,008	W. Coast of America, 1 to 80,000 & 53,001 to 53,008	2½	Nil	2½%	2½%	..	1⅜ — 1⅝	1⅜ — 1⅝	..	..	— ⅛	3 16 11
150,000	Do. 4 % Debs., 1 to 1,500 guar. by Braz. Sub. Tel.	100	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..	3 18 5
207,980	Western Telegraph, Ltd., Nos. 1 to 207,980.. ..	10	7 %	7 %	7 %	..	12⅞ — 13⅜	12⅞ — 13⅜	13⅛	13	..	5 4 8
800,000	Do. do. 4 % Deb. Stock Red. ..	100	4 %	4 %	4 %	4 %	101 —103	101 —103	..	..	..	3 17
88,221	West India and Panama Telegraph	10	Nil	Nil	Nil	Nil	⅛ — ⅜	⅛ — ⅜	..	..	..	Nil
84,563	Do. do. 6 % Cum. 1st Pref.	10	5 %	8 %	6 %	6 %	7⅞ — 8⅛	7⅞ — 8⅛	..	..	..	7 3 3
4,669	Do. do. 6 % Cum. 2nd Pref.	10	Nil	Nil	£2 6	..	7¼ — 8¼	7¼ — 8¼	..	..	..	2 14 1
80,000	Do. do. 5 % Debs., Nos. 1 to 1,800 ..	100	5 %	5 %	5 %	5 %	100 —102	100 —102	..	..	..	4 18 0

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.

890,000	Anglo-Argentine Trams, 10 % Nom. Cum. 2nd Pref., 260,008 to 580,097	5	8 %	8 %	9 %	10 %	8¾— 9⅛	8¾— 9⅛	9	8⅛	..	5 0 7
560,007	Do. 6 % Cum. Prefs., 1 to 260,007	5	5½%	5½%	5⅝%	6 %	5½— 6⅛	6 — 6½	..	..	+ ⅛	4 16 0
266,500	Do. Old, 6 % Deb. Stock, 1888 ..	100	6 %	6 %	6 %	6 %	..	..	..	..	..	4 4 6
285,100	Auckland E. Trams, 5 % 1st Mort. Deb. Stock ..	100	5 %	5 %	5 %	5 %	102 —104	102 —104	..	..	..	4 16 2
580,000	Babcock & Wilcox, 1 to 580,000	1	20 %	20 %	20 %	..	4⅛ — 4⅜	4⅛ — 4⅜	87/3	85/-	..	4 18 0
100,000	Do. do. 6 % Cum. Pref., 1 to 100,000 ..	1	6 %	6 %	6 %	6 %	1⅝ — 1⅞	1⅝ — 1⅞	..	..	..	3 18 10
60,000	British Aluminium, Ord., 1 to 40,000	5	7 %	7 %	7 %	..	1⅞ — 2	1⅝ — 1¾	..	..	— ⅜	20 0 0
60,000	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	3 — 3⅛	2⅝ — 2⅞	62/6	60/-	— 1	11 4 0
40,100	Do. do. "A" 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	3⅞ — 4⅛	3¾ — 4	..	..	— ½	7 10 0
12,897	Do. do. 4 % Funding Certs.	5	4 %	4 %	4 %	4 %	3¾ — 4⅛	3⅞ — 4⅛	..	..	..	4 8 11
124,400	Do. do. 5½ % Loch Leven Debs. ..	100	..	5½%	5½%	5½%	96 — 98	96 — 98	..	..	..	5 12 3
500,000	British Columbia E. Rail Def. Ord. Stock ..	100	6 %	6 %	8 %	8 %	140 —143	142 —146	144	143	+ 2½	5 9 7
400,000	Do. Pref. Ord. Stock	100	5 %	5 %	6 %	6 %	120 —124	120 —124	121	..	..	4 16 9
800,000	Do. 5 % Cum. Perp. Pref. Stock	100	5 %	5 %	5 %	5 %	105¾—107½	105¾—107½	107	106½	..	4 13 0
288,000	Do. 4½ % 1st Mort. Debs., 1 to 6,250	40	4½%	4½%	4½%	4½%	102½—104½	102½—104½	103½	..	..	10 15 8
250,000	Do. 4½ % Vancouver Power Debs., 1 to 2,900	100	4½%	4½%	4½%	4½%	101 —104	101 —104	..	..	..	4 6 7
188,801	British Electric Traction	10	3 %	Nil	Nil	..	1⅛ — 1⅜	⅝ — ⅞	13/9	..	— ⅛	Nil
161,457	Do. do. 6 % Cum. Pref.	10	6 %	6 %	8 %	..	2⅜ — 2⅝	2⅛ — 3	55/-	50/-	— ⅜	10 0 0
1,478,658	Do. do. 5 % Perp. Deb. Stock ..	Stock	5 %	5 %	5 %	5 %	88 — 93	87 — 91	90⅜	89	—2	5 9 11
628,936	Do. do. 4½ % 2nd Deb. Stock Red.	100	4½%	4½%	4½%	4½%	70 — 75	70 — 75	..	..	..	6 0 0
100,000	British Insulated and Helsby Cables	5	8 %	10 %	10 %	10 %	6⅞ — 7⅛	7 — 7⅛	..	..	+ ⅛	6 13 4
100,000	Do. do. 6 % Cum. Pref.	5	6 %	6 %	6 %	6 %	6 — 6⅛	6 — 6⅛	..	..	..	4 14 1
500,000	Do. do. 4½ % 1st Mort. Deb. Red...	100	4½%	4½%	4½%	4½%	104 —107	104 —107	..	..	..	4 4 1
208,440	British Thomson-Houston 4½ % 1st Mort. Debs. ..	100	4½%	4½%	4½%	4½%	91 — 96	91 — 96	..	..	..	4 18 11
400,000	British Westinghouse 6 % Pref., 1 to 200,000 and 275,001 to 475,000	5	Nil	Nil	Nil	..	⅞ — 1	⅞ — 1	..	..	..	Nil
1,016,858	Do. do. 4 % Mort. Deb. Stock ..	100	4 %	4 %	4 %	..	39 — 44	38 — 43	..	..	—1	9 6 0
50,000	‡Browett, Lindley & Co., Ord.	1	Nil	Nil	Nil	..	⅞ — 1⅛	⅞ — 1⅛	..	..	..	Nil
50,000	‡ Do. do. 6 % Cum. Pref.	1	Nil	Nil	Nil	..	14/6 to 15/6	14/6 to 15/6	..	..	..	Nil
140,976	Brush Electrical Engineering, Ord., 1 to 105,781 ..	2	2½%	Nil	Nil	..	0 — ¼	0 — ¼	..	..	..	Nil
200,000	Do. do. Non-cum. 6 % Pref.	2	6 %	Nil	Nil	..	0 — ¼	0 — ¼	1/9	..	..	Nil
125,000	Do. do. 4½ % Perp. Deb. Stock ..	Stock	4½%	4½%	4½%	4½%	57 — 62	57 — 62	..	..	..	7 5 2
125,000	Do. do. 4½ % Perp. 2nd Deb. Stock..	Stock	4½%	4½%	4½%	4½%	33 — 38	33 — 38	..	..	..	10 16 10
187,610	Calcutta Trams, 1 to 187,610	5	8 %	8 %	6 %	..	4⅜ — 5	4⅜ — 5	96/3	..	..	6 0 0
45,304	Do. 5 % Cum. Pref., Nos. 1 to 29,880..	5	5 %	5 %	5 %	5 %	4⅜ — 5⅜	4⅜ — 5⅜	5/-	..	..	4 13 0
850,000	Do. 4½ % 1st Deb. Stock..	100	4½%	4½%	4½%	4½%	99 —102	99 —102	101	100	..	4 8 3
85,000	Callender's Cable Construction shares	5	15 %	15 %	15 %	..	9⅛ — 10⅛	9⅛ — 10⅛	10	..	..	7 2 10
40,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	5 %	5⅛ — 5⅜	5⅛ — 5⅜	..	..	..	4 6 11
800,000	Do. do. 4½ % 1st Mort. Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	105 —107	105 —107	..	..	..	4 4 1
491,225	Cape E Trams., 1 to 491,222	1	Nil	Nil	Nil	..	⅛ — ⅜	⅛ — ⅜	..	..	..	Nil
450,000	Castner-Kellner Alkali, 1 to 450,000	1	6 %	8 %	12 %	..	1⅝ — 1⅞	1⅝ — 1⅞	33/-	32/6	..	6 17 2
210,158	Do. do. 4½ % 1st Mort. Deb. Stock	100	4½%	4½%	4½%	..	103 —107	103 —107	..	..	..	4 4 1
1,898,610	Central London Railway, Ord. Stock..	Stock	4 %	4 %	3 %	3½%	62 — 64	62 — 64	62½	..	..	5 1 7
553,195	Do. do. 4 % Pref. Stock	Stock	4 %	4 %	4 %	4 %	82 — 84	82 — 84	..	..	..	4 15 8
553,195	Do. do. Def. do.	Stock	4 %	4 %	2 %	2½%	45 — 47	45 — 47	..	..	..	5 2 0
1,480,000	City and South London Railway	Stock	1⅞%	2½%	2½%	1½%	27⅞ — 28⅛	28 — 29	29	27⅞	+ ⅛	5 3 5
85,000	Crompton & Co., Nos. 1 to 85,000	5	2½%	5 %	5 %	5 %	1 — 1⅛	1 — 1⅛	20/7½	20/-	..	11 2 2
100,000	Do. 5 % 1st Mort. Reg. Debs., 1 to 900 of £100, and 901 to 11,000 of £50 Red.	..	5 %	5 %	5 %	5 %	95 — 98	15 — 98	..	..	..	5 2 0

* Unless otherwise stated, all shares are fully paid † A period of nine months. ‡ From Manchester Share List

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—(*Continued.*)

ELECTRICAL RAILWAY, MANUFACTURING AND INDUSTRIAL COMPANIES.—(*Continued.*)

Present Issue.	NAME.	Stock or Share.	Dividends for the last four years.				Closing Quotations Mar. 23rd.	Closing Quotations Mar. 30th.	Business done week ended Mar. 30th, 1909.		Rise + or Fall —	Present Yield per cent.
		*	1906.	1906.	1907.	1908.			Highest	Lowest.		£ s. d.
260,000	Dick, Kerr & Co., 1 to 260,000	1	10 %	10 %	10 %	10 %	1 1/8 — 1 1/4	1 1/8 — 1 1/4	..	..	..	8 0 0
305,000	Do. do. 6 % Cum. Pref., 1 to 305,000	1	6 %	6 %	6 %	6 %	1 1/8 — 1 1/4	1 1/8 — 1 1/4	..	..	..	4 16 0
276,880	Do. do. 4½ % Deb. Stock	100	4½ %	4½ %	4½ %	4½ %	101 —104	101 —104	..	..	..	4 6 7
60,000	Dublin United Trams. (1896), 1 to 60,000	10	6 %	6 %	6¼ %	6 %	11¼ — 12½	11¼ — 12½	..	..	..	4 16 0
60,000	Do. 6 % Pref. between 1 and 60,000	10	6 %	6 %	6 %	6 %	12¼ — 13½	12¼ — 13½	..	..	..	4 8 11
99,261	Edison & Swan Utd., "A" shs., £8 pd., 1 to 99,261	5	4½ %	4½ %	4½ %	..	5/8 — 11/16	5/8 — 11/16	6/6	..	..	20 0 0
17,139	Do. "A" shares, 01—017,139	5	4½ %	4½ %	4½ %	..	1¼ — 2½	1¼ — 2½	..	..	..	8 6 9
317,875	Do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	75 — 78	75 — 78	..	..	..	5 2 7
67,720	Do. 5 % 2nd Deb. Stock Prov. Certs. all pd.	100	5 %	5 %	5 %	..	86 — 89	86 — 89	..	..	..	5 12 4
112,100	Electric Construction, 1 to 112,100	2	Nil	Nil	Nil	Nil	1/16 — 3/16	1/16 — 1/8	6/6	..	— 1/16	Nil
31,390	Do. do. 7 % Cum. Pref., 1 to 31,390	2	7 %	7 %	7 %	7 %	1½ — 1¾	1 — 1⅛	23/9	..	— 1/16	9 6 8
25,000	General Electric Co. (1900), 5 % Cum. Pref.	10	5 %	5 %	5 %	..	7¼ — 7½	7¼ — 7⅝	..	..	..	6 9 0
200,000	Do. do 4 % Mort Deb.	Stock	4 %	4 %	4 %	4 %	85 — 89	85 — 89	..	..	..	4 9 11
78,000	Gt. N. & City Rail. Pref. Ord. "A" 4 %, 1 to 78,000	10	4 %	4 %	3½ %	Nil	3/16 — 5/16	3/16 — 5/16	..	..	..	3 6 8
96,000	Greenwood & Batley, 7 % Cum. Pref.	10	7 %	7 %	7 %	..	10¼ — 10⅝	10¼ — 10⅝	..	..	..	6 10 8
80,000	Do. do. 5 % Mort. Debs.	100	5 %	5 %	5 %	5 %	102 —103½	102 —103	..	..	..	4 16 10
40,000	Henley's (W. T.), Telegraph Works, Ord.	5	15%	15 %	15%	15 %	11½ — 12½	11½ — 12½	11½	..	..	6 0 0
40,000	Do. do. 4½ % Pref.	5	4½%	4½%	4½%	4½%	5 — 5½	5 — 5½	..	..	..	4 1 10
150,000	Do. do. 4½ % Mort. Deb. Stock	Stock	4½%	4½%	4½%	4½%	106 —108	106 —108	106½	..	..	4 3 4
50,000	India-Rubber, Gutta-percha & Telegraph Works..	10	10%	10 %	10 %	..	15 — 16	15 — 16	15	..	..	6 5 0
37,500	†Liverpool Overhead Railway, Ord.	10	Nil	Nil	½%	Nil	1 — 1⅛	1 — 1⅛	..	..	..	5 6 8
10,000	† Do. do. Pref., fully paid	10	5 %	5 %	5 %	5 %	4½ — 5½	4½ — 5½	..	..	..	9 10 6
600,070	London United Trams. (1901), 1 to 50,007	10	3 %	3 %	3 %	Nil	2 — 3	2 — 3	..	..	..	4 8 11
399,980	Do. do. 60,008 to 100,000	10	3 %	3 %	3 %	Nil	3½ — 4	3½ — 4	..	..	..	4 8 11
125,000	Do. do. 5 % Cum. Pref., 1 to 125,000	10	5 %	5 %	5 %	3⅜%	3½ — 4½	3 — 4	80/-	78/9	— ⅛	9 7 6
1,331,000	Do. do. 4 % 1st Mort. Deb. Stock	100	4 %	4 %	4 %	4 %	74 — 79	71 — 76	..	..	—3	5 5 3
5,732,062	Metropolitan Consolidated	100	2⅜%	1 ⅜%	⅜%	⅜%	34 — 35	35½ — 36½	36	34	+1½	1 7 5
2,640,914	Do. Surplus Lands	100	2⅜%	2⅜%	2⅜%	2⅜%	68 — 70	68 — 70	69	68½	..	3 18 7
3,285,000	Do. District	100	Nil	Nil	Nil	Nil	13½ — 14	14 — 14½	14⅜	13½	+ ⅛	Nil
391,337	Metropolitan Electric Trams., Ord.	1	..	..	..	4½%	11/16 — 13/16	11/16 — 13/16	..	..	..	..
314,016	Do. do. Debs.	1	Nil	Nil	Nil	..	3/16 — 5/16	3/16 — 5/16	..	..	..	Nil
500,000	Do. do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	23/32 — 25/32	23/32 — 25/32	..	..	..	5 19 5
600,000	Do. do. 4½ % Deb. Stock Red.	100	4½%	4½%	4½%	4½%	94 — 96	93 — 96	..	..	..	4 13 9
$6,000,000	Mexico Trams Co., Common Stock	..	..	..	..	..	124 —126	127—129	127	132½	+3	..
$9,000,000	Do. 1st Mort. 50-year 5% Gld. Bds.	..	..	..	..	..	90½ — 91¾	91½ — 92½	92	91	+ ½	5 8 1
245,500	Potteries E. Tro.	1	4 %	4 %	4 %	5 %	1/16 — 3/16	1/16 — 3/16	..	..	..	8 0 0
245,500	Do. 5 % Cum. Pref.	1	5 %	5 %	5 %	5 %	1/16 — 3/16	1/16 — 3/16	..	..	..	6 17 11
245,000	Do. 4½ % Deb. Stock	100	4½%	4½%	4½%	4½%	89 — 91	88 — 91	..	..	..	4 18 11
37,350	Telegraph Construction and Maintenance	12	15 %	15 %	17½%	15 %	32 — 34	32 — 34	32	..	..	5 14 10
150,000	Do. 4 % Deb. Bds., 1 to 1,500 Red., 1909	100	4 %	4 %	4 %	4 %	100 —102	100 —102	..	..	..	3 18 5
1,000,000	Underground Electric Railway, 5% Prior Lien	..	..	..	..	..	100¾—101¼	101 —102	101¾	101½	+ ⅛	..
2,800,000	Do. do. 4½% Bonds	..	..	..	..	4½%	81 — 83	81 — 83	83	82½	..	5 9 9
4,900,000	Do. do. 6% Income Bonds	..	..	..	..	..	27 — 29	27 — 29	..	..	..	..
66,666	Willans & Robinson, 1 to 30,000 & 80,001 to 116,666	1	Nil	Nil	10 %	Nil	3/16 — 5/16	3/16 — 5/16	..	..	..	10 0 0
66,666	Do. 6 % C.P., 30,001 to 80,000 & 125,001 to 141,666	5	Nil	..	6 %	6 %	2 — 2½	2 — 2½	..	..	..	12 0 0
246,404	Do. 4 % 1st Mort. Deb. Stock	..	4 %	4 %	4 %	4 %	68 — 72	68 — 72	..	..	..	5 11 1

ELECTRICITY SUPPLY COMPANIES.

15,000	Bromley (Kent) E.L. & P., 1 to 15,000	..	5⅛%	5⅛%	5⅛%	..	4½ — 5	4½ — 5	..	..	..	5 10 0
70,000	Do. do. 4½ % 1st. deb. stock	100	4½%	4½%	4½%	4½%	95 — 98	95 — 98	..	..	..	4 11 10
80,275	Brompton & Kens. Elec. Lt. Sup., Ord., 1 to 20,000	5	10 %	10%	10 %	10 %	8⅜ — 8⅝	8⅜ — 8⅝	..	..	..	5 15 11
9,725	Do. do. 7 % Cum. Pref.	5	7 %	7 %	7 %	7 %	8 — 8½	8 — 8½	..	..	..	4 2 4
333,876	Central Electric Supply 4 % Guar. Deb. Stock	100	4 %	4 %	4 %	4 %	99 —102	99 — 102	..	..	..	3 18 5
80,000	Charing Cross and Strand Electricity Supply	5	5 %	5 %	5 %	5 %	3¾ — 4⅛	3⅞ — 4⅛	..	..	— ⅛	5 17 8
80,000	Do. do. do. 4½ % Cum. Pref.	5	4½%	4½%	4½%	4½%	4 — 4⅛	4 — 4⅛	76/3	..	— ⅛	5 0 0
80,000	Do. "City Undertaking" 4½ % Cum. Prf.	5	4½%	4½%	4½%	4½%	3⅝ — 4⅛	3⅝ — 4⅛	..	..	..	5 9 1
445,736	Do. do. 4 % Deb. Stock Red.	100	4 %	4 %	4 %	4 %	96 — 98	96 — 98	..	..	..	4 1 8
49,486	Chelsea Electricity Supply, Ord.	5	6 %	4½%	4½%	4½%	3⅝ — 4	3⅝ — 3⅞	..	..	— 1/16	5 16 2
175,000	Do. do. 4½ % Deb. Stock Red.	Stock	4½%	4½%	4½%	4½%	102 —105	102 —105	..	..	..	4 5 9
70,595	City of London Elec. Lighting, Ord. 40,001—110,595	10	6 %	8 %	6 %	6 %	10½ — 11	10½ — 11	10⅝	..	..	5 9 1
40,000	Do. 6 % Cum. Pref., 1 to 40,000	10	6 %	6 %	6 %	6 %	12¼ — 13	12¼ — 13	12½	12⅝	..	4 12 4
400,000	Do. 5 % Db. Stk., Scrip. (iss. at 115) all pd.	..	5 %	5 %	5 %	5 %	121 —123	121 —123	..	..	..	4 1 4
800,000	Do. 4½ % 2nd. Db. Stk., Prov. Crts., all pd.	100	4½%	4½%	4½%	4½%	100 —103	100 —103	100⅜	..	..	3 1 6
50,000	County of Durham Electrical Power, Ord.	5	4 %	4 %	2 %	..	2⅝ — 3	2⅞ — 3⅛	..	..	+ ⅛	8 6 8
50,000	Do. do. do. 5 % Pref.	5	5 %	5 %	5 %	..	3¼ — 3½	3¼ — 3½	..	..	..	6 13 4
250,000	Do. do. do. 5 % 1st Mtg. Deb.	Stock	..	..	..	5 %	96 — 98	96 — 98	..	..	..	..
40,000	County of London Electric Lighting, Ord. 1—40,000	10	5 %	5 %	5 %	5 %	8⅝ — 9⅛	8⅝ — 9⅛	..	..	..	5 9 7
50,997	Do. do. 6 % Pref., 40,001—50,000	10	6 %	6 %	6 %	6 %	10⅝ — 11¼	10⅝ — 11¼	11⅛	..	..	5 6 8
400,000	Do. do. 4½ % Deb. Stock	..	4½%	4½%	4½%	4½%	105 —108	105 —108	108	..	..	4 3 4
400,000	Do. do. 4½ % 2nd. Deb. Stock	Stock	4½%	4½%	4½%	4½%	100 —103	100 —108	..	..	..	4 7 5
80,000	Edmundson's Electric Corporation, Ord. Shares	5	4 %	Nil	Nil	Nil	3/16 — 5/16	3/16 — 5/16	..	..	..	Nil
80,000	Do. do. 6 % Cum. Pref.	5	6 %	8 %	Nil	Nil	3/16 — 5/16	3/16 — 5/16	..	..	..	Nil
430,500	Do. do. 4½ % 1st Mort. Deb. Stk.	100	4½%	4½%	4½%	4½%	59 — 62	59 — 62	..	..	..	7 0 8
$8,150,000	Electrical Dev.Co.of Ontario, 5% 1stMtg.Gold Bnds.	$500	..	..	..	5 %	84 — 86	85 — 87	86	85½	+ 1	5 14 11
10,000	Folkestone, 1 to 10,000	5	5½%	5½%	5½%	..	4½ — 5	4½ — 5	..	..	..	5 10 0
10,000	Do. 5 % Cum. Pref., 1 to 10,000	5	5 %	5 %	5 %	..	5 — 5½	5 — 5½	..	..	..	4 10 0
90,000	Do. 4½ % 1st Deb. Stock	100	4½%	4½%	4½%	4½%	95 — 98	95 — 98	96½	96	..	4 11 10
15,000	Hove, 1 to 15,000	5	9 %	9 %	8½%	8½%	7 — 7½	7½ — 7⅝	..	..	+ ½	5 9 8
$2,400,000	Kaministiquia Power Co., 5 % Gold Bnds.	..	..	..	..	5 %	96½ — 98½	96⅝ — 98⅝	97⅜	..	..	5 0 0
21,000	Kensington and Knightsbridge Electric Ord.	5	10 %	10 %	10 %	8 %	7¼ — 7½	7¼ — 7⅝	..	..	..	6 1 3
90,000	Do. do. do. 4 % Deben. Stk.	Stock	4 %	4 %	4 %	4 %	93 — 96	93 — 96	..	..	..	4 0 0
111,000	London Electric Supply Corporation, Limited, Ord.	3	4 %	4 %	2½%	3 %	1⅞ — 2⅛	1⅞ — 2⅛	..	..	..	4 16 0
70,000	Do. do. do 6 % Pref.	5	6 %	6 %	6 %	6 %	5 — 5⅜	5 — 5⅜	5½	5⅜	..	5 11 8
874,295	Do. do. 4 % 1st Mort. Deb. Stk. Red.	Stock	4 %	4½%	4½%	4 %	92 — 96	92 — 96	94½	94	..	4 3 4
200,000	Metropolitan Electric Supply, 1 to 100,000	5	10 %	8 %	6½%	5 %	4½ — 5	4½ — 5	96/3	94/4½	..	6 3 10
76,121	Do. 4½ % Cum. Pref. 1—71,106	5	4½%	4½%	4½%	4½%	4½ — 5	4½ — 5	..	..	..	4 10 0
920,000	Do. 4½ % 1st Mort. Debens. Stock	..	4½%	4½%	4½%	4½%	106 —109	106 —109	107	..	..	4 2 7
248,000	Do. 3½ % Mort. Deben. Stock Redeem.	Stock	3½%	3½%	3½%	3½%	85 — 88	85 — 88	..	..	..	3 19 7
$6,000,000	Mexican Electric Light Co., 5% 1st Mtg. Gold Bnds	..	5 %	5 %	5 %	5 %	86 — 87	86½ — 87½	87	86½	+ ½	5 14 3
13,585,000	Do. Light and Power Co., Ltd., Common	$100	..	..	..	3½%	76½ — 77½	79 — 81	80	77	+2½	4 6 5
$1,500,000	Do. do. 7% Cum. Pref. Stk.	Stock	..	..	..	7 %	108 —110	108 —110	..	..	..	6 7 3
$12,000,000	Do. do. 5% 1st Mtg. Gold Bnds.	..	..	..	..	5 %	89 — 90	89½ — 90¾	90½	90	+ ⅝	5 10 2
350,000	Midland Electric Corporation, 4½ % 1st Mort. Deb.	100	4½%	4½%	4½%	4½%	95 — 98	95 — 98	..	..	..	4 11 10
87,500	Newcastle-on-Tyne, 1 to 87,500	5	8 %	8 %	8 %	..	3⅞ — 4⅛	4⅛ — 4⅜	..	..	+ ⅛	8 8 5
87,500	Do. 5 % Pref., 1 to 87,500	5	5 %	5 %	5 %	..	4⅜ — 5⅛	5 — 5⅛	..	..	..	4 18 0
126,500	North Metropolitan Electric Power Supply Co., 5 % Mortgages (Red.), Nos. 1 to 1,265	100	..	..	..	..	100 —102	100 —102	..	..	..	..
10,852	Notting Hill Electric Lighting	10	7½%	7½%	7½%	7 %	10⅜ — 11⅜	10⅜ — 11⅛	..	..	— ⅛	6 4 5
20,000	Oxford, 1 to 96 and 407 to 20,310	5	7 %	7 %	7 %	..	6 — 6½	6 — 6¼	6⅜	6⅛	+ ⅛	5 7 8
60,000	Do. 4 % Deb. Stock	100	4 %	4 %	4 %	4 %	94 — 97	94 — 97	..	..	..	4 1 8
119,694	River Plate Elcty. Co. Ord. Nos. 1 to 120,507	1	..	2½%	6 %	8 %	1⅜ — 1⅝	1⅜ — 1⅝	26/-	22/-	..	..
100,000	Do. do. 6% Non Cum. Pref. Nos. 1 to 100,000	1	6 %	6 %	6 %	6 %	1⅜ — 1⅝	1⅜ — 1⅝	22/-	..	..	5 4 4
194,684	Do. do. 5% Deb. Stk. Red.	100	5 %	5 %	5 %	5 %	100 —103	100 —103	102½	..	..	4 17 1
40,000	St. James' and Pall Mall Electric Light, Ord.	5	12½%	10 %	10 %	10 %	8⅜ — 8¾	8⅜ — 8¾	8⅝	8¼	..	5 12 8
20,000	Do. do. 7 % Pref. 20,001 to 40,000	5	7 %	7 %	7 %	7 %	6⅝ — 7⅛	6¾ — 7⅛	7 1/16	..	+ ⅛	4 14 11
150,000	Do. do. 3½ % Deb. Stock Red.	100	3 %	3½%	3½%	3½%	86 — 90	86 — 90	..	..	..	3 17 9
12,000	Smithfield Markets Electric Supply, Ord.	5	4 %	Nil	Nil	..	1/16 — 1/8	1/16 — 1/8	..	..	..	Nil
46,700	Do. do. do. 4 % Deb. Stock	Stock	4 %	4 %	4 %	4 %	63 — 70	63 — 70	..	..	..	5 11 1
65,000	South London Electric Supply, Ord.	4	4 %	5 %	4 %	5 %	2½ — 2¾	2⅝ — 3	..	..	+ ⅛	6 13 4
120,000	South Met. Elec. Lt. & Power, Ord.	1	2½%	2½%	2½%	2½%	1/16 — 3/16	1/16 — 3/16	..	..	..	4 0 0
142,968	Do. do. 7 % Pref.	1	7 %	7 %	7 %	7 %	1¼ — 1½	1⅜ — 1½	..	..	..	5 12 0
220,000	Do. do. 4½ % 1st Deb. Stk.	100	4½%	4½%	4½%	4½%	102 —105	102 —105	..	..	..	4 5 9
80,000	Urban Electric Supply, Ord.	5	5 %	5 %	5 %	..	⅞ — 1	1 — 1	..	..	— 1/16	20 0 0
60,000	Do. do. 5 % Cum. Pref.	5	5 %	5 %	5 %	..	1¼ — 2	1½ — 2	88/9	35/-	..	12 10 0
275,000	Do. do. 4½ % 1st Mort. Db. Stk. Red.	100	4½%	4½%	4½%	4½%	78 — 82	78 — 82	80	..	..	5 9 9
808,000	Victoria Falls Power Co., Pref. Nos. 1 to 808,000	1	..	..	..	..	13/16 — 15/16	13/16 — 15/16	..	..	..	..
110,000	Westminster Electric Supply, Ord.	5	12 %	12 %	10 %	10 %	8¾ — 9⅛	8¾ — 9⅛	..	..	..	5 8 1
81,979	Do. 4½ % Cum. Pref. Reduced from 5% since 31st Dec., 1905)	5	5 %	4½%	4½%	4½%	5⅛ — 5⅜	5⅛ — 5⅜	5⅜	5⅛	..	4 1 10

* Unless otherwise stated, all shares are fully paid. † Quotations on Liverpool Stock Exchange. Interim Dividend.

Bank rate of Discount, 3 per cent., January 14th, 1909.

NOTES ON BRAZIL.

[From a Special Correspondent in Brazil.]

The writer of this article, having spent a considerable time in Brazil, feels himself justified in making a few remarks, mainly in the interests of British manufacturers, in the hope that they may benefit thereby. Being an electrical engineer, his remarks apply principally to that line of business, but, in many cases, they apply equally to other lines. Previous to going to Brazil, the writer spent some time in one of the Colonies, and recognises the similarity of methods adopted in attempts at trade getting; he would like to point out that there is but little in common between Brazil and any one of our Colonies, and that colonial methods are ill-adapted to Brazil.

Taking catalogues, for instances, how many of the manufacturers at home who send these to Brazil, understand that Portuguese is the language of that country? Many houses seem to think they have done exceedingly well in sending them in Spanish, whereas that language is almost as foreign to a Brazilian as our own tongue is. Others, again, send English catalogues, which may be excusable, but why they go to the trouble of sending an accompanying letter in Spanish, passes the writer's comprehension, and they may be sure that a Brazilian certainly does not take it as a compliment to his country.

During the writer's residence in Brazil, he has received many catalogues from British firms, most of them in English, a few in Spanish, but not in a single instance in the language of the country. German manufacturers, on the other hand, seem to be better informed, for about 50 per cent. of the catalogues received from them are in Portuguese, some of them even improving on this, for the writer has at hand at the present moment a German catalogue written in four different languages. This is not a pamphlet, but a catalogue of considerable dimensions, the matter it contains being in English, German, Spanish and Portuguese, which makes it a useful article for both North and South America, containing as it does practically all the languages spoken there. American catalogues, again, are mostly in English, with a few in Portuguese. Some of these Yankee concoctions are after the style of their yellow press, with descriptions on the principle of a house agent's advertisement and illustrations as beautifully embellished as the picture of a seaside resort. The writer has known these catalogues to secure an order, but never a customer.

To manufacturers on the look out for new business the writer suggests that a few good catalogues (in Portuguese if possible, but if not in English with a covering letter in Portuguese) placed in the right quarters in Brazil would do something to further their interests; for these catalogues are usually carefully kept and often referred to, it being from them that a Brazilian usually decides his requirements.

Ignoring statistics and judging only from the number of commercial travellers visiting Brazil, one would say that the trade of Britain and Germany was about on a par with, perhaps, a slight advantage to Britain, and with the United States as a bad third. It is, however, useless to take the nationality of a traveller only as the guide, for there are many Germans representing British and Yankee firms. The German seems to make a better foreign traveller than either an Englishman or an American, for he adapts himself more easily and more willingly to the language and ways of the country he happens to be in, and no doubt many English houses have found this so. It has been said, too, that a German will sit on the door-step of a prospective customer's establishment until he gets an order. This may or may not be true, but certainly persistency pays when dealing with a Brazilian, for he loves to dally over business and likes to be coaxed to buy. Usually the first two days of a traveller calling on a customer, in Brazil, are spent in discussing the weather or any other convenient subject, and should the man of samples dare to approach too seriously to business, he will no doubt be met with a harrowing tale of bad trade. This, however, is not to be taken as a criterion that there is nothing to be done in that shop, for a quiet call each day very often leads to a respectable order. The writer has known a traveller call on a Brazilian house for four days in succession, and judging from the first interview, a less knowing man would have been inclined to give it up as a bad job; but it paid in the end, for each day the traveller got nearer to the object of his visit, and he finished up by booking an order worth several thousand pounds. The worst of it was, too, that probably the Brazilian had the order in his mind all the time.

The most essential part of a traveller's equipment, when visiting Brazil, is a knowledge of the language. With English only, a man can go practically anywhere, but if he knows the language of the country he is in, he can get there much quicker and cheaper, and to try and do business in Brazil, without Portuguese, is a waste of time and money. A traveller should also have a certain amount of knowledge of the ways and customs of the people, and should certainly have a sound knowledge of the goods he is trying to sell. If his line is machinery he should, besides being especially conversant with his own particular machines, be a practical engineer, for he may often be asked to decide all sorts of engineering problems, and it will be much to his benefit to be able to do so without hesitation. It may be added that the popular idea in Brazil is that every Britisher is an engineer.

A trip through Brazil is an expensive undertaking, and the man doing it will find that he is called upon to put his hand into his pocket deep and often. A moderate estimate for travelling expenses would be £50 per month, and five or six months would be required to visit the principal towns; certainly not more than 15 could be worked in that time. Many towns, a traveller could work in three or four days, but has to wait an extra week before he can get away, owing to the irregularity of the boats and the scarcity of trains. In some cases it would be much better to extend the trip for a year and include Argentine in the round, and if the smaller towns are left out, Chile might also be added with advantage.

A never-failing source of annoyance to travellers is the Customs' duties, for imports are charged at the entry to each State irrespective of what has already been paid in duties. There certainly are laws regulating the duty on samples, but the Custom House officials have not much respect for laws, and can make things very unpleasant, especially by delays; it is, therefore, a bad policy to fall out with these gentlemen, and the mere mention of a consul or the law, acts on them as a red rag does to the proverbial bull. A few "milreis" diplomatically given, very often saves money. A favourite way with travellers carrying many samples, is to place, say, a 20 milreis note on the top inside one of the boxes. When these are being examined, he looks in the other direction, and if when he goes to close his box, the note is still there, he may expect to pay full duty, but if it has disappeared, then he has every probability of getting off lightly. This succeeds oftener than it fails, and the traveller need have no fear of the "Corrupt Practices Act" in Brazil.

There are in all the ports, Custom House brokers, called in Brazil "despachantes," who make a business of clearing goods; they are naturally conversant with the various forms of Custom House procedure, and for business reasons are on very friendly terms with the officials, so that in many cases it is beneficial, and in some cases necessary, to engage these gentlemen to clear baggage.

Many firms simply depend on agents in Brazil to look after their interests and secure what orders they can; others, again have, in addition to their agents, travellers who make periodical visits to the country, looking up old customers, and, at the same time, endeavouring to secure new ones. This latter course, although naturally much more expensive, seems to pay judging by the number who adopt it. The length of time between each visit is sometimes fixed, but more often is regulated according to the state of the trade.

A Brazilian usually admits the superiority of the British article; especially is this so with machinery, but very often force of circumstances compels him to purchase what he knows is not the best. Prices, for instance, usually rule his choice. It is the price, and not the quality of the article, that is the more important feature in the Brazilian market, and this is where the Germans are getting in; for they, as a rule, have a cheaper article to push. To a Brazilian, cost represents what

he pays for a thing; upkeep, life and efficiency being of the future, he but seldom considers them. Another point that makes the cheaper machines, &c., more acceptable, s that they have to work under most trying conditions and generally receive but little attention, so that their life is a short one. Take, for example, electric light sets, oil engines or ice making machines (for which there is a fair demand in the smaller sizes), the treatment these receive under working conditions makes the better class unnecessary and out of place, and also quite unrecognisable in a short time. If some of the manufacturers or designers saw the results of their labour after a few months' working in Brazil, they would immediately disown them. The writer can quote from his own experience, and also knows of several other instances where machinery has been left out in the weather through a tropical wet season for over six months, without a cover of any kind, and then erected and expected to work well. One instance especially occurs to the writer where a pump, not wanted at the time of disembarkation, was left on the beach for nearly eight months, and when required had to be dug out of the sand. This pump, however, is now working merrily in Bahia new waterworks, for things like these the Brazilian looks upon as trifles, and he would have been very much annoyed with the suppliers if it had not worked.

The British taste is not necessarily that of the rest of the world, nor is the Brazilian idea of beauty synonymous with the Britisher's, as the writer would point out by the following instance. He had in his stores a number of electroliers of the usual kind supplied and used in Britain, namely, polished brass and bronzed. As an experiment he ordered out from Germany a number of cheap glass ones, beautiful, gaudy, cheap-looking things to his mind, but strange to say, in less than a week after unpacking and stringing the parts together he had sold the lot, and had to dispatch post haste for three times the quantity of his first order; these he is now selling at the rate of ten to one of the more solid and lasting, but less sparkling, variety.

It must not be thought from the foregoing that there are no openings for British goods in Brazil, but neither must it be understood that it is a happy dumping ground, for although a Brazilian very often does not know what he wants, he usually knows what he does not want.

Flexibility is a term that has crept very much into use in connection with engineering, and if the manufacturers would apply it to their own methods when dealing with Brazil, both in advertising and in manufacturing, they would, no doubt, benefit much in that market.

Strength and simplicity of design, even at the expense of neatness and efficiency, is what Brazil wants. Let the price be low, and if there must be a finish of some sort, let it be a cheap one, even if it looks, to the Britisher's idea, gaudy. A Brazilian electrical engineer (?) has no compunction in continually breaking 1,000 volts across a switch built for 250, neither will he stick at altering the mechanism of a beautifully regulated arc lamp to suit his own requirements. In the same way, the care he bestows on a motor or engine is meagre, for he is perfectly satisfied as long as it works. What, then, is the use of efficiency or neatness?

Manufacturers will see from this what their goods may have to go through; although they could always disclaim responsibility, they are nevertheless blamed in every case of failure, and their reputation consequently must suffer in that district at least.

As previously stated, all that is required of a machine of any kind is that it will work and do what its nameplate says it will. Let it be strong, simple, and cheap, for everything else counts as naught, these points only ruling the choice of a Brazilian customer.

The "Watkin" Switch.—In the library of the Royal Institution, last Friday evening, Messrs. Adams & Co. gave an exhibition and demonstration of the Watkin switch and electric current controller. The effect of the switch was shown upon a bank of metallic-filament lamps, and upon carbon-filament lamps—both singly and in groups; also upon an electric fan, a kettle, and surgical appliances. Messrs. Adams also exhibited a smaller type of "Watkin" switch, specially designed for use in cabins, &c., on board ship; these have already been fitted by Messrs. Harland and Wolff throughout the Atlantic transport liner the *Minnewaska*.

THE PATENTS ACT, 1907, EXPOUNDED.

The case of *in re* Hatschek's patent, in which Mr. Justice Parker gave judgment on Friday last, involved the discussion of certain questions relating to the Patents Act, 1907, which are of vital importance to patentees who are not working their inventions in this country. We say "discussion" advisedly, for the learned judge laid himself out to express his views as to the general policy of the Act. It may be that the views so expressed by him are in fact mere *obiter dicta*, and not binding upon other judges, but in view of the fact that Mr. Justice Parker is the patent judge before whom the decision of questions of this kind is always bound to come, the importance of the opinions which he expressed cannot well be over-rated.

Sec. 27 of the Act of 1907 provides, in effect, that after a certain space of time, any person may apply to the Comptroller for revocation of a patent on the ground that it is carried on "exclusively or mainly" outside the United Kingdom. Then, unless the patentee proves that the process is carried on to an adequate extent in the United Kingdom, or gives satisfactory reasons why it is not so carried on, the Comptroller may revoke. The meaning of this section has hitherto been wrapt in mystery. Mr. Justice Parker set himself to expound it.

Dealing in the first place with the meaning of this Section and Sec. 24 (which relates to the grant of compulsory licences), he said:—

> The mischiefs which they were intended to meet are well known. It was felt to be intolerable that letters patent for inventions which create monopolies, and are therefore in themselves contrary to the spirit of the common law as being restraints of trade, and which were only excepted from the encouragement of trade by the inventions useful in trade, and in consideration of the disclosure of such inventions to the public, should be used (as they had in fact been used) to prevent the development of new industries or to fetter existing industries in this country.

He then pointed out that anyone, whether he has any real interest in the development of British industries or not, whether a foreigner or a British subject, and whatever his motive, can, by satisfying the Comptroller of the existence of the state of circumstances mentioned in Sec. 27, make a patentee either prove that his patent is worked here, or give satisfactory reasons for his default:—

> The keynote of the section is, in my opinion, forfeiture for abuse of the monopoly at the instance of even a common informer, the abuse being in certain circumstances presumed unless otherwise disproved.

Pausing here, it seems to us that it may at some future time become necessary to place some limitation upon the powers of persons who have no genuine interest in the patent. Thus, according to the law as above expounded, a mere foreign infringer of a patent who desires to open up the British market for his wares may set the law in motion against the patentee.

Mr. Justice Parker next considered the meaning of the words "exclusively or mainly." What does "mainly" mean? It was argued that a patented article was not made "mainly" abroad, unless more than 50 per cent. of the articles were manufactured abroad. After expressing his dissent from this view, his Lordship said:—

> The word "mainly" is used in the sub-section in close connection with and as an alternative to the word "exclusively," and, having regard to this fact, I do not think that a process or article can be said to be mainly carried on or manufactured abroad merely because it is carried on or manufactured abroad to a somewhat greater extent than within the United Kingdom. For example, if the total manufacture in the United Kingdom were 1,200 and the total manufacture elsewhere 1,250, giving a total of 2,450 in all, I do not think it could be said that the manufacture was mainly abroad within the meaning of the section; to come within the sub-section the disparity must, in my opinion, be greater than a mere small percentage, and, indeed, if the article be manufactured or the process be carried on within the United Kingdom, not only to a substantial extent, but to an extent as substantial as may reasonably be expected, having regard to what is done abroad, I do not think the state of circumstances is that contemplated by sub-Sec. 1.

Another important question was also considered. It has been contended on behalf of patentees that, in comparing manufacture abroad with manufacture in these islands, the Court is bound to consider whether the articles manufactured abroad are imported into this country. In other words, it has been argued that articles manufactured abroad do not come within the monopoly area, unless they are imported into this country. As to this, the learned judge said :—

> In my opinion, therefore, the sub-section institutes a comparison between the extent to which the article or process, the subject of the patent, is manufactured or carried on in this country, and the extent to which it is manufactured or carried on abroad, whether the articles so manufactured or resulting from the process so carried on abroad are or are not imported into this country.

It follows from this that all manufacture abroad is to be considered, whether the foreign manufacturer supplies his fellow countrymen, or sends goods in to compete with us at home.

It was also suggested that the comparison between home and foreign manufacture must be made strictly between legitimate manufacture abroad under licence or foreign patents, and legitimate manufacture at home. The learned judge rejected this contention also :—

> Suppose the patentee had no foreign patents, and yet, for some reason of his own, chose to prevent the industry arising here, while industries in the patented article or process were being developed abroad, I think the section would apply. It seems to me that the section is meant to hit any abuse of the monopoly the object or result of which was to benefit foreigners at the expense of the traders within the United Kingdom.

He next proceeded to consider what is meant by manufacture within the United Kingdom to an "adequate extent," and "satisfactory" reasons to explain the absence of such manufacture. In his Lordship's view, the Legislature designedly left the meaning of these terms quite at large, it being for the Comptroller (subject to an appeal to the Court) to put a meaning upon them according to the facts of each particular case. Nevertheless, he said :—

> I do not think the extent to which the article is manufactured, or the process carried on, can be considered adequate if it be less than it would have been but for the fact that the patentee has exercised the rights conferred by his patent to the hurt of British industry—for example, the fact that he has given foreign traders a preference over British traders. Similarly, I do not think that any reasons can be satisfactory which do not account for the inadequacy of the extent to which the patented article is manufactured, or the patented process is carried on in this country, by causes operating irrespective of any abuse of the monopoly granted by his patent.

He pointed out, further, that it is the conduct of the patentee which is in question. It must be looked at, having regard to the interests of the trade of the United Kingdom. The patentee certainly ought not to give foreigners any preferential terms in the grant of licences or otherwise, nor ought he to develop foreign industries as opposed to those of the United Kingdom, and then seek to defend his conduct by offering to grant licences on the same terms here as he has granted them abroad :—

> If he exercises his rights in such a way as to give other countries four years' start of this country in developing a new industry, he is not, in my opinion, exercising his rights fairly as regards the trade of this country. He must at least take the same pains to develop the new industry here as he does abroad.

His Lordship also had a word or two to say as to Free Trade and Protection. He is not prepared to hold that a patentee who has allowed part of the home demand to be satisfied by importation from abroad, has necessarily precluded himself from proving that the manufacture of the patented article is adequate, or from giving satisfactory reasons why it is not adequate :—

> The policy of the section appears to me to be directed to securing fair play between foreign industries and the industries of this country, and not to secure for the latter during the period of the patent a protection which they would not enjoy if no patent had been granted, and which the Legislature can always secure for them, either temporarily or permanently, if and when it considers fit.

His Lordship concludes the above part of his judgment by saying that "adequate" cannot mean simply adequate to supply the demand in this country, or be considered only with reference to the demand in this country for the article. Even if there were no demand here at all, the manufacture might be inadequate because the rights of the patentee might have been so exercised as to preclude the growth of the demand by the imposition of unreasonable prices or unreasonable terms for licences, or simply because this country had been neglected in order to develop a foreign trade.

The mere fact that the patent cannot be worked at a profit in this country is not a sufficient reason for not working :—

> But it can never, in my opinion, be sufficient for a patentee defending himself under the section to prove that he cannot now start an industry with any chance of profit.
> The question really is—Could he have done so if he had used his monopoly fairly as between home and foreign trade, or if he had devoted the time and money which he has expended in developing a foreign industry to developing a home industry? It may well be that, having developed the industry abroad and given foreigners several years' start, he may find it difficult, if not impossible, to develop an industry on the same lines here; and yet such an industry might well have arisen but for the preference he has given to foreign countries.

His Lordship dealt at some length with a contention which had been urged before him—namely, that patentees whose patents were in force prior to the commencement of the present Act, were entitled to different treatment to those who have taken out patents since the Act came into force. He came to the conclusion that all patentees must be dealt with alike.

He next drew attention to a really serious defect in the way in which the Act is now administered under the Patent Rules. As those rules now stand, anyone who is attacking a patentee for not working need give no evidence in support of his statement, although, in Mr. Justice Parker's view, the onus of satisfying the Comptroller of the truth of the statement is on the applicant. Under the existing *régime*, the patentee must state whether the allegation is true or untrue. If he says it is untrue, he must support his case by evidence. Commenting on this, his Lordship said :—

> Such a procedure, besides being, in my opinion, most unfair to the patentee, is obviously open to very serious abuse. Even if the patented article or process is not manufactured or carried on abroad at all; yet, if anyone makes an application under this section, the unfortunate patentee has to disclose, perhaps to some competitor or intending competitor, particulars of his business which he may not desire to disclose, and to give evidence in defence of his conduct before any case raising a presumption against him has been made out. . . . Inasmuch as an application under the section can be made by anyone, whatever may be his motive, and the section in effect penalises patentees who have abused their monopoly, it is, in my opinion, all the more necessary, in order to prevent the section being improperly used, to insist that every applicant shall give at any rate *prima facie* evidence of the existence of the state of affairs contemplated by Sec. 1, before the patentee is put to the trouble and expense of finding out and proving the extent to which the patented process or article is manufactured or carried on in this country or abroad, and of explaining and justifying everything he has done since the grant of his patent.

His Lordship suggests that in future the proper course for the Comptroller will be to make the applicant, upon whom the onus lies, tender evidence in order to make out some case requiring an answer. Unless some such evidence is forthcoming, there will be no need to call upon the patentee to supply an answer. Although he is of opinion that rules now in force are such that the Comptroller can at once exercise this power, his Lordship considers that they should be so altered as to make the matter quite clear.

> It must be remembered that the section is in its nature a penal section, that the patentee is on his trial, that mere accusation raises no presumption of guilt, and that the Comptroller is a Court exercising judicial functions. It is not merely the case of a departmental inquiry.

With regard to the procedure to be adopted on appeals from the Comptroller, the learned judge says that the practice will be not to allow the parties to call fresh evidence before the Court.

He then dealt with the actual facts relating to Hatschek's patent, and decided that the decision of the Comptroller, who had revoked that patent, ought to be affirmed.

As we said at the beginning of these notes, many of the observations of the learned judge were not strictly relevant to the inquiry before him. Nevertheless they will probably prove to be of the utmost value to those who may have to oppose or support a patent before the Comptroller in the near future.

FAULTS ON TRAMCAR MOTORS.

By SPENCER ROBINSON.

Owing to the restricted space available for the carriage of the motors beneath the body of a car, the construction of the motor is a matter of great difficulty; this is fully realised when the effective depth between the body and the ground line is observed. This small space therefore necessitates the use of motors which, through want of room, are especially liable to breakdowns, the more usual causes being: open circuits, short circuits, grounded armatures, loose commutators, loose armature cores, &c. In stationary motors these breakdowns do not occur with the frequency noticeable on the traction motors, there being no space restrictions on the former, so that the manufacturer has more scope to obtain better results. In addition to the construction of the motor itself, further reasons for a number of breakdowns are the steep gradients and the heavy work for which the motors are employed.

It is the object of this article to deal with those faults which, unfortunately, occur only too often in tramway work, and to suggest the most practical means of readily locating the fault and repairing the damage.

Open Circuits.—These are of very frequent occurrence, and are probably more common than any other fault that is met with in traction motors. They are often occasioned by bad soldering of the armature connections, but more frequently by loose commutators or loose armature cores, and although only of a trivial nature, unless dealt with in time will prove a source of very considerable trouble through the burning of the commutator segments, and possibly the armature. It is therefore always advisable to deal with an open circuit immediately it has been detected.

When an open circuit occurs the automatic switch generally "blows," and the defective motor should be cut out of circuit, but sometimes an occasion occurs when the automatic switch declines to blow, and in such a case it would prove fatal to the motor. When an open circuit is suspected, if the trap of the motor case is raised, the commutator segments will be found pitted at points diametrically opposite, and on removing the armature from the motor case, the faulty coil can easily be distinguished. An open circuit on a running car can at once be detected by continuous flashing from opposite points on the periphery of the commutator.

Should the damage only be the breaking of the armature leads, these can be spliced with wire of similar gauge, but if the damage be such that the commutator segments are badly burnt, then it is necessary to unscrew the commutator ring (in certain cases the wiper ring must be removed first), when the segments and micas can be easily withdrawn and replaced by new ones.

Short Circuits.—These occur in armatures, fields, and resistances. In the case of armatures this trouble is generally due to the coils getting bared, and consequently coming in contact with each other; another cause is overheating, but this defect can usually be detected by the smell of burnt insulation, and trouble of this nature can be overcome by cutting out of circuit the damaged coil, or, if necessary, the coil must be withdrawn and a new one fitted in its place.

The method of cutting out a damaged coil is to disconnect the coil from the commutator, and cut off the leads, the free ends of which should be well taped: then short-circuit the commutator segments to which the faulty coil had been connected by means of a "jumper" or small piece of wire of similar gauge to that employed in the winding; in this condition the armature will run for a considerable time. If the coil has to be removed altogether, it will be necessary to lift several of the top leads of the armature winding and remove the wire bands.

If a short-circuit occurs in the field coils, it is due generally to damp soaking through the insulation, or is caused by the coils working loose in the cradles. A fault of this kind on the field coils is immediately detected by the necessary increase of speed of the car owing to the weakened field. When the damage is only of a slight nature, the coil after it has been taken from the motor case should be stripped of its insulation and then well baked to get rid of all damp, after which it should be thoroughly insulated.

If the damage be of a more serious nature, the wire must be cut off and spliced with wire of corresponding gauge. It is also a good plan to shellac these coils well before baking. When resistances get short-circuited it is usually due to dampness or coming into contact with other working parts of the car, but with trouble of this kind it is only a matter of removing the damaged coils from the resistance and slipping on new ones if necessary. Resistances defective in this way can be detected by the irregular speed of the car.

Earthed or Grounded Armatures and Resistances.—This trouble occurs with armatures more frequently on tramway undertakings where steep gradients are unavoidable. When armatures become grounded, either the power is "earthed" or the automatic switch "blows," and one motor will be rendered useless, and should at once be cut out.

Generally the "earth" can be detected on the surface of the armature, where often the coil or iron core is burnt. It will usually be found necessary with a fault of this kind to remove all the armature coils from the core, and should any copper be found welded to the inside of the slots, this should at once be filed down, as if this is overlooked, it will naturally do considerable damage to the new coils when the armature is rewound.

Should the resistances get "earthed," it is usually due to brake rods or sand chains coming into contact with them, but this trouble is only of a slight nature, and can generally be put right by clearing the rods, &c. A fault of this description is readily detected, as the car refuses to start.

Loose Commutators.—These occur more frequently with special types of motors, and are a source of great trouble. They are caused by the commutator working loose on the shaft. When this occurs, it produces open circuits in the armature and broken connections, and to repair this defect it is necessary to raise all the armature leads and withdraw the commutator from the shaft. A new key should be fitted and the commutator replaced and pressed up by hydraulic pressure.

If the damage done to the armature coils is only slight, it will be necessary to splice the damaged coils with the same gauge of wire as that employed in the winding. Cars with defective motors of this kind should on no account be allowed to leave the sheds, as is sometimes done, as the longer they run the more damage is done to the armature winding, and in some cases it is absolutely necessary to rewind the armature entirely.

Flats on Commutators.—These do not occur frequently, but when they are discovered the commutator should be turned in a lathe, as if it is allowed to run in this defective condition it will occasion a breakage of brushes. Trouble of this nature is attributed to the varying hardness of the copper segments, and is detected by continuous sparking and damaged brushes.

Careful attention should be given to the adjustment of the brushes; they should not bear unevenly on the surface of the commutator, as this seriously affects the efficiency of the motor, and causes excessive sparking and uneven wear of the commutator.

Loose Armature Cores.—These, fortunately, are not of frequent occurrence. When a fault of this kind develops, it generally indicates damage to the armature coils through broken leads. When broken armature connections and pitted commutator bars are observed, it is generally due to loose armature cores or loose commutators, and upon withdrawing the armature from the motor case and testing the core by endeavouring to drive a small chisel between the stampings, it will readily be ascertained whether the core is loose or not. Should the core be loose, it will be necessary to lift all the armature connections and remove all the coils from the core, after which the commutator and stampings should be taken off and a new key fitted.

The stampings after being well varnished should be placed on the shaft and pressed up tight by hydraulic pressure, after which the commutator must be replaced. Then, after the slots in the core have been thoroughly filed out and all the burrs removed, the old coils should be replaced, or, if badly damaged, the armature must be rewound with new coils.

Bearings.—These are one of the most important items to be dealt with in connection with the successful running of

any motor. In the writer's experience no fewer than three armatures were taken out of the same car in one day, absolutely burnt out, owing entirely to "seized" bearings. Seized bearings are usually detected by a considerable amount of smoke issuing from beneath the body of the car.

The armature bearings should be made of gun-metal. Sometimes a row of holes drilled in a zig-zag fashion in the crown of a bearing are filled up with white metal to reduce friction. Iron bearings are sometimes used lined with white metal, but are not advised, owing to the liability of the metal to melt.

The bearings should be periodically filled with oil, and greasepots should be fixed over them. The oil is prevented from reaching the commutator by means of wiper rings shrunk on the shaft.

PROCEEDINGS OF INSTITUTIONS.

Extending the Limits of Power Transmission.

By A. M. Taylor, M.I.E.E.

(*Abstract of paper read before the* Institution of Electrical Engineers *at Birmingham, March 10th*, 1909.)

The cost of long-distance three-phase overhead lines may be divided up into the cost of copper and the cost of supports. The capital cost of copper at £60 per ton, employing an initial voltage of 270 volts per mile of line, a current density of 250 amperes per sq. in., and a combined drop of 35 volts per mile, amounts to, roughly, £20 per effective kw. transmitted, assuming power factor equal to 80 per cent.

On a 100-mile line this would mean an initial voltage of 27,000, a total combined drop of 13 per cent., and a capital cost of £20 per kilowatt transmitted, which, on a 25 per cent. load factor, and taking interest, sinking fund, maintenance, and depreciation at 25 per cent. per annum, would mean a charge of roughly ½d. per unit transmitted. By increasing the length of line to 122 miles, the line voltage being kept at 27,000, the capital cost per kilowatt would be increased to £30 per kilowatt transmitted.

For the supports for light lines we may take £200 per mile as a minimum figure, while for heavy lines £500 per mile may be easily reached, excluding wayleaves.

Assume the power delivered to the receiving end of the line to be, say, 10,000 kw., requiring the heavier line construction. A line 100 miles long would cost £50,000, or £5 per kw. transmitted, for the capital cost of poles and insulators. A smaller line, for, say, 1,000 kw., would cost £20 per kw. transmitted, for the same items.

It will be evident that on copper figures, and with a limit of 27,000 volts and 10,000 kw., 100 to 120 miles is about the economical limit for the bulk of the transmission, and 50 miles with 1,000 kw., except where coal is very dear.

Any means which would halve the cost of the copper in the line would virtually increase by some 30 to 40 per cent. the possible distance of supply (in bulk), and thus be extremely useful in bringing water-power—which is mostly in inaccessible spots—to the big towns, where there is a demand for the power.

In many cases, especially where the line has to traverse mountainous districts for many miles, and is subject to interruptions through difficulties of inspection, &c., it becomes desirable to duplicate both poles and wires, and the cost of the line is thereby doubled. The author's proposal is that electrical storage on a large scale should be carried out at the distributing centres, the reliability of the line being thereby increased to an extent that would warrant a second line being dispensed with. At the same time, it is not necessary to trade upon the latter assumption in order to show a case for storage.

The batteries would be arranged to take up 50 per cent. of the peak, thereby halving the copper costs for the line.

In the case of a 10,000-kw. 122-mile transmission with a single line, without raising the e.m.f. or increasing the line drop, the radius of transmission can be extended to 165 miles for the same total capital cost of 30 + 6 = £36 per kw. transmitted.

To cover this distance, *with a single line*, and with the e.m.f. limited to 27,000 volts, would have cost, without storage, some £63 per kw. transmitted. The storage scheme is thus some £27 per kw. the cheaper, as far as the line is concerned.

If the 122-mile line above considered had been run in duplicate as regards the copper, only one line of poles, however, being provided, the radius of transmission could have been extended from 122 miles to about 230 miles without increasing the capital costs of the line.

It will, no doubt, be objected that the author has taken too low a voltage, and that 50,000 volts might with advantage have been considered. But against this it may be said that the higher voltage brings its own disadvantages, and that, where the line has to pass through damp or smoky districts, the higher voltage would be risky.

Another point that makes for the reduction in voltage is the fact that the distributing part of the line not infrequently equals the transmitting part of the line in length or is worked at a lower voltage. Consequently, the total cost of the line and distributors will really be that of a line working at an average voltage much below that of the initial voltage; and any saving effected on the first part of the line is, in part, compensated by the cost of the extra step-down transformers and the higher insulation wanted throughout the high-tension section.

In the example already considered, the resistance loss would be 8 per cent., and with a current density of 400 amperes per sq. in. this might be run up to 16 per cent. With a battery at the distant end of the line a much greater resistance drop than 8 per cent. could be allowed in the line without the regulation of voltage being seriously affected; and in most cases a greater resistance drop will be considered preferable to the risks introduced by increasing the voltage.

Whether 50,000 volts or 30,000 volts be employed, the percentage increase in the length of the line effected by the use of accumulators, for a given total copper cost, remains unaltered; but the item for supports is evidently greater, in proportion to that for the copper, with the higher voltage, and somewhat reduces the length that would otherwise be permissible.

If we take account of the much greater facilities for regulation provided by the employment of storage at the receiving end of the line, it will be found possible to double the resistance drop in the line, and thus to roughly double the distance of transmission. Thus, the 122-mile single line could be lengthened to 220 miles, without any additional cost being incurred on the line, by the employment of storage; while, had the line been originally laid out in duplicate (as far as copper is concerned), it could have been extended to 304 miles for the same total cost in copper and supports.

Considering the desirability of being able to shut down one half of the line copper for repairs to insulators, &c., it will often be found advantageous to provide the spare copper circuit, where there is no storage. With storage at the consumers' end of the line, it is, of course, possible to deaden the line at certain times of the day without interrupting the supply.

The batteries and auxiliaries required for storage can in most, if not in all, cases be provided for out of the saving in generating plant, step-up and step-down transformers, turbines, head works, and buildings, only half the horse-power being needed that would otherwise be required.

Where the heads of water are low, the costs of the plant and head works run up rapidly; the average costs stated to have been incurred in some of the Swiss water-powers are about £73 per kilowatt.

On falls such as these the saving in generating plant and head works would suffice to extend the line to no less than 210 miles without increasing the total capital cost of the scheme, as compared with a single-line 122-mile scheme without storage. The further extension, due to saving in line copper, has, of course, to be added.

The cost of batteries would be about £10 per kilowatt, to which about £3 10s. per kilowatt must be added for auxiliaries and accessories, on alternating current systems.

Where the batteries cannot be paid for out of the saving in generating plant, they must, of course, be paid for in part out of the line savings, *i.e.*, the full benefit of the increased lengths above indicated, cannot be obtained.

The advantage of having a stand-by at the consumers' end of the line, equal to the maximum capacity of the whole scheme for short periods, is one which, of course, cannot easily be expressed in monetary value, but is nevertheless very great.

The savings on a large power transmission scheme by the introduction of storage are not confined to the items above considered, such fixed charges as wages, management, taxes, water-power purchase rights, &c., being *all* reduced with the reduction in the rated size of the generating station and line; and these would, of themselves, more than pay for the cost of maintenance of the batteries and auxiliaries.

The author believes that similar arguments to the above will influence those power companies which have to cover large areas, in the direction of putting down accumulators at the distributing centres, or offering their customers such terms for current during restricted hours, for charging purposes, as will induce them to put down accumulators.

Take the case of a small town on the outskirts of a power company's area. If the power company has to run a special feeder out to that town, it may easily happen that the costs of that feeder, especially in duplicate, may run into £10 or more per kilowatt of maximum demand, and if the load factor is low, this is a serious item. In this case the savings in fixed charges at the generating station would alone pay for the cells, and the saving in the feeder could be put down as clear profit.

If a power company had to run a special feeder 10 miles long to pick up the load of a small town, it would cost them, if the load was not above 1,000 kw., something like £20 per kw. if the feeder was laid in duplicate. Much greater reliability of supply could, with storage, be obtained with a single feeder of only 50 to 60 per cent. of the sectional area of one of the others, the capital cost in such case being not much more than half. The battery costs need not be debited to the feeder, for they will be saved over again in other directions, and the result is a clear saving in feeder outlay of £8 to £10 per kw.—enough, in some cases, to make the difference between profit and loss.

The author would like to call attention to the, in his opinion, somewhat prodigal provision for generating stations made by several of the power companies.

In view of the saving, both in capital cost and in working expenses, of large stations as against small ones—the saving in the former being given by Mr. Addenbrooke recently as amounting to £17 per kilowatt of maximum demand, exclusive of distribution, as between 2,500 kw. and 40,000 kw.—the author thinks that suffi-

cient attention has, perhaps, hardly been paid to the desirability of covering a large area from a given power station, even at, if necessary, rather higher costs for distribution.

It is found that, with 10,000 volts and 1,000 amperes per sq. in., the resistance drop amounts to 7½ per cent. per 10 miles. Since, in the early stages of the scheme, it would be most unlikely that the current density would average, throughout the length of the cable, anything higher than 500 amperes per sq. in., the drop on a 10-mile radius may probably be taken as not exceeding 3¾ per cent. It would, therefore, look as though it would have been safe to space the stations, say, 18 to 20 miles apart instead of 10 to 12 miles apart, as obtains in several cases, and to put down transformer sub-stations, where the voltage could be boosted up if necessary.

Where accumulator sub-stations are put down for dealing with the peak of the load, the load transmitted at the time of the peak can in some cases be reduced to one-half. This may be taken advantage of, either to cut down copper and save in capital outlay in the transmission line, or to double the length of that line and increase the distance between generating stations from 18 miles to 36 miles. The voltage regulation at the boundaries of the system will be so improved by the employment of the battery sub-stations that a greater loss in transmission may be allowed, and thus sufficient copper be saved to both double the length of the copper conductor and pay for the cost of insulating, armouring, and laying the additional length.

Such an extension of the radius of supply would, in many cases, represent quadruple the load on a single station, and enable companies supplying sparsely-populated districts, or large areas, to avail themselves of the saving in the capital invested in, and in the working expenses of, the generating station, which Mr. Addenbrooke very rightly pointed out can be made.

In accumulator sub-stations with alternating-currents, there is not much experience to go on in this country; but in the United States considerable attention is apparently being given to the use of rotary converters.

In conjunction with storage batteries on alternating-current systems it might be thought at first sight that the energy losses on an alternating-current scheme would be serious, but, on a water-power scheme, the cost of each unit of electricity put into the battery, if put in at suitable times, is only of the order of 0·05d.; consequently, neither the efficiency of the rotary converter nor that of the battery is so important as to weigh seriously in comparison with the charges on the line and generating plant.

On a power company's distribution scheme, where the power is generated by steam, the cost of the energy put into the cells for charging purposes is only of the order of 0·10d. per unit; so that here again the efficiency of the rotary converters and of the battery is not so important as might be thought.

Discussion.

Mr. W. E. Chappell criticised the figure of £500 per mile that the author had taken for the capital cost of heavy overhead lines. He knew of a case where a 10,000-kw. heavy line with iron poles had been put down for £293 per mile. He thought that when it came to actual practice the amount saved by using a battery would be nothing like that suggested by Mr. Taylor. There were several such systems in the U.S.A., but, on the whole, they showed no distinct advantage over other systems. He instanced a case in which the original transmission voltage was 40,000; as the load increased, this was changed to 50,000, and later still to 60,000. This increasing of the voltage could be carried up to a certain point, and until that point was reached there was not much chance for the battery. Also, he could not agree that it would be advisable to cut the copper down to half, even with a battery installed at the receiving end; should anything go wrong with the battery, it would be impossible to do anything from the supply end without the other 50 per cent. of copper.

Mr. J. P. Kemp agreed that there was a good deal to be said for the adoption of accumulators, but was not in agreement with Mr. Taylor as to the extraordinarily low cost of ·1d. per kw.-hour for the energy put into the battery. Mr. Taylor evidently assumed that the battery charging was done without running any additional plant, but it would sometimes be found necessary to run additional plant in order that the battery might be charged in the time allotted; in which case, the cost of the energy would certainly exceed the figure he gave. He was not aware of any place where more than 10 per cent. of the peak had been taken up by batteries.

Mr. F. Forrest criticised the author's figures of 270 volts per mile and 250 amperes per square inch, as being unduly low. The difficulties attending the use of high voltage had been successfully overcome, particularly in the large scheme at present working in California. Although the author claimed that one line with batteries would be as safe as double lines without them, should this single line break down, it might easily take several days to repair it, especially in a mountainous country, and the battery would only be capable of taking the load for two or three hours. Also the efficiency was very low, and engineers would hesitate to adopt a system that would involve a loss of 45 per cent. of the units generated.

Mr. W. E. Groves agreed that mains in duplicate, each capable of taking full load, were indispensable. In stating the case for batteries, therefore, saving in copper in the line should not be used as an argument in their favour.

Mr. P. R. Voulton said that the cost of energy put into the battery, even in a fairly large station, must be nearer 0·2d. than 0·1d. per unit, as stated. If they took the heating limit as the determining factor for current density and not the voltage drop, they would find that they had no voltage left at the receiving end. He suggested a compromise, employing batteries of a smaller capacity.

Mr. N. B. Rosher (Birmingham) referring to the author's figure of 25 per cent. on the copper part of the transmission line, said that assuming interest to be at the rate of 5 per cent., and depreciation and sinking fund 8 per cent., this would leave 12 per cent. for maintenance, an extremely high figure, especially in view of the fact that the copper part of the line only was included and not the supports. Taking the author's figure of £20 per kw. as the cost of copper on a 10,000-kw. 100-mile transmission line, the maintenance at 12 per cent. worked out at £2,400 per mile. The use of a battery to supply 50 per cent. of the peak load would mean an improvement of at least 40 per cent. in the load factor.

Dr. Kapp pointed out that the idea of using batteries to extend the radius of transmission had already been applied, though perhaps not in the extensive and perfect manner advocated by the author. The reason why some Swiss water-power stations were costly was that, in many cases, a steam reserve had to be provided. He agreed with Mr. Addenbrooke that engineers had not overlooked the possibility of using the accumulator as a means of extending the area of the district served, but they naturally shirked the financial responsibility. The use of accumulators had been fully considered in the remodelling of the public supply of Lucerne. The town acquired a large water-power in Engelberg, and this was transmitted to Lucerne and distributed by means of the old network. To provide against interruption of the transmission line, two ways of accumulating energy were studied—one by batteries, and the other by the creation of an artificial reservoir on a neighbouring mountain, into which water would be pumped when there was a surplus of power. Of the two schemes, the latter appeared to the engineers rather the safer of the two, and in planning the sub-station, the possibility that at some future time such a system of storage might have to be adopted, was kept in view. It was not a new departure; the principle of storing energy in an artificial high-level reservoir had been put into practice in Canton Araua by Messrs. Brown, Boveri. The efficiency could naturally not be very high—about 50 per cent. or thereabouts—but as the energy required to pump up the water was surplus energy, costing practically nothing, and the maintenance cost of the hydraulic works was very small, there was a clear gain by this kind of storage. In connection with the large power station now being erected by the town of Bâle, on the Rhine at Augst, provision was being made to add, if required, hydraulic storage.

Mr. G. L. Addenbrooke, in a written communication, said that in 1896 he read a paper before the Institution on "High-Voltage Lamps and their Influence on Central Station Practice," in which a considerable space was devoted to the use of accumulators, very closely on the lines Mr. Taylor was now advocating. At that time the capital cost, including buildings, was £19 per kw., as against £13 10s. in Mr. Taylor's estimate, although this does not appear to include buildings. Against this in my paper, the sum of £19 per kilowatt was taken as the cost of a large central station plant, whereas, the cost at present would be about £13. Relatively, therefore, the position does not seem to have altered very much. It does not appear that the suggestions as to the use of accumulators on the ends of feeders have found general favour, and I take it this is not because the matter has been overlooked by engineers, but because each one took up the circumstances of his own particular installation, and has found that on the whole the balance of advantages did not warrant the outlay in accumulators. In the case of a very large power company or corporation supplying such a large amount of energy as we may contemplate, in the future, it might pay them to run an accumulator factory themselves, doing their own repairs and making their own plates. Assuming that a line of a certain capacity is erected, and the line is necessary in any case, the cost of doubling the section of the copper or of raising the voltage 50 per cent., is a comparatively small addition to the whole cost, and in this way the full demand can be met by supply from the central station. It is not altogether fair to base calculations on a line 100 miles long, operated at 27,000 volts; in modern practice, at least 50,000 volts would be used for this. Doubling the voltage, increases the amount of energy conveyed with the same percentage drop about four times, and alters the basis of calculation altogether. The same argument applies in connection with underground cables; to increase the section of the copper somewhat does not, by any means, proportionately increase the cost of the whole feeder, and power companies purpose to work almost entirely by means of loops. Referring to the work done in France with overhead transmission, where the smaller townships and villages are able to secure the advantages of light and power, in two or three instances he had attempted to lay the foundations for such work, but he had found the legal and Parliamentary obstacles so serious, and the demands of the local authorities so onerous, that until matters in these respects could be amended, there was little hope that capital could be profitably devoted to such purposes.

Mr. R. Orsettich, in a written communication, said that the figure of 270 initial volts per mile was too low. The well-known American rule was 1,000 volts per mile for the first three miles, and 400 volts per mile for each subsequent mile. In this way, on a 100-mile line, instead of the 27,000 volts proposed, one would have to take 42,000 volts. The extension of the Vizzola transmission in the north of Italy would work at a voltage of 45,000 for a maximum distance of 113 miles, and the new plant that Messrs. Siemens had installed for the Spanish Hydro-Electric Co. was transmitting 16,000 h.p. (later 32,000 h.p.), 160 miles with 66,000 volts. Further, some 12 plants in the United States, whose maximum transmission distance was about 100 miles, were working with a voltage of 60,000, or thereabouts. Several companies had

found that, in order to obtain economical conditions of working, they had to raise their voltage, as soon as the experience gained in the working of the line enabled them to do so with safety. The increased cost of supports, transformers and switchgear would represent only about 28 per cent. of the cost for doubling the voltage to 40,000; this would be entirely cancelled by the saving in copper, which would be reduced to one-quarter of the original amount. The heavy amount put down by the author for the cost of copper had also been accounted for through the limit fixed for the combined drop in the line, which should at least be fixed at 25 to 30 per cent., instead of 13 per cent. A "heavy" line fitted with 14 metallic supports to the mile, each suitable for three ⅜-in. diameter wires, would work out complete, including erection and insulators, but exclusive of copper, at £210 per mile. The life of the metallic poles could be taken at about 20 to 25 years, and the figure of 25 per cent. per annum included by the author for sinking fund, depreciation and maintenance was very much higher than was usually assumed to be a commercial figure. To the proposed adoption of storage batteries in connection with long-distance transmission, the principal objection would be the necessity of converting the alternating current to continuous, with rotating machinery and expensive switchgear. The limited range of each battery would necessitate a very large number of batteries. The battery would be only designed to supply the peak load, and therefore in the best cases to keep up the supply for half a day in case of breakdown. The peak itself was not of real importance as far as the line was concerned. The real difficulty with hydraulic plants lay in the fact that the supply could be kept up only for 9 or 10 months at the most, and that a reserve in steam plant was necessary for the other two months.

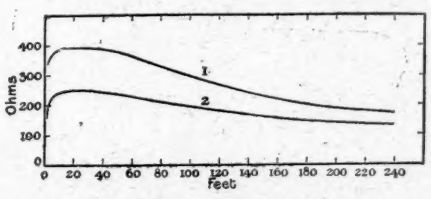
Mr. Taylor, replying to the discussion, said that repairs would have to be effected to the line, whether there was storage or not. The special feature of storage was that if a breakdown occurred in the transmission line, there would be two or three hours during which consumers could be notified that a breakdown had occurred. It was absolutely necessary to keep the current density down to about 250 amperes per sq. in. if they were to keep the total cost per kw. down. They could not go to the same high voltages here or on the Continent as was possible in America, probably on account of climatic conditions. They must remember that there was a day and a half for charging at the end of every week. On a town load, such as that at Birmingham, he would recommend taking up not more than 30 per cent. of the peak with accumulators; but up to that point it would probably be unnecessary to increase the engine hours above those now obtaining, and under these conditions he maintained that, with large steam turbines and cheap coal, 0·1d. was a possible figure.

Electric Traction Vagabond Currents.

By J. G. Cunliffe and R. G. Cunliffe, Students.

(*Abstract of paper read before the* Institution of Electrical Engineers *at Manchester, March 9th*, 1909.)

At different times it has been contended, as the outcome of experiments, that the earth conducts either wholly electrolytically, or, on the other hand, partly as an electrolyte, partly as a metallic conductor. The authors have experimented with copper plates in a concentrated solution of common salt, with current densities



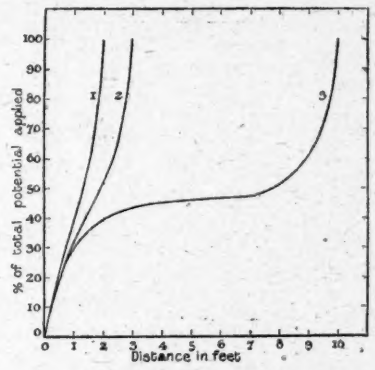
Curve 1, Resistance by direct current.
„ 2, Resistance by alternating current.

Fig. 1.—Resistance Distance Curves. Plates each 1 sq. ft. in area.

from 0 to 48 amperes per square foot of plate, measuring the pressure and current, and the polarisation e.m.f.'s. They have also experimented with numerous descriptions of soil, and have come to the conclusion that "earth conductivity is invariably of an electrolytic nature, although on account of the physical properties of the soil the fact may sometimes be concealed to superficial observation."

Further experiments have been made to ascertain the variation of resistance with distance between copper plates of various sizes buried in a vertical plane, with their upper edges lying in the surface of the ground. It has been found that with increasing distance the value of the resistance increases rapidly to a maximum, after which it falls at first quickly, then more slowly, finally becoming almost constant (fig. 1). This is due to the increasing length of the path traversed by the current and to the increasing cross-sectional area of the path, the former predominating at first and the latter afterwards. The conclusion is that the resistance to earth of a plate of given size depends entirely upon the size and distance of the other electrode. The resistance falls rapidly with increasing size of plate until an area of 6 sq. ft. is reached, after which further increase in size has little effect; this, the authors say, is due to the high specific resistance of the soil, which effectually prevents the attainment of a high-current density at the surface of the plates.

Other experiments have been carried out with a view to the determination of the conducting paths in the earth between plates of equal size buried in the earth, in a vertical plane, with their upper edges in the surface; the potential gradients are shown in fig. 2, and it will be seen that as the distance between the plates increases, the central portion of the gradient becomes more nearly horizontal, due to the increasing cross-section of the current path. The greater part of the drop occurs at the cathode. Practically the whole of the potential is lost within a distance of 3 ft. of the



Curve 1, Plates of equal area 2 ft. apart.
„ 2, „ „ 3 „
„ 3, „ „ 10 „

Fig. 2.—Potential Gradients between Earth Plates.

plates; this 3 ft. limit is of importance, being independent of the size of the plates and of the nature of the soil, provided the latter is homogeneous within that radius. Similar results have been obtained from the tramway track itself; the equipotential curves and current stream lines round the rails are unaffected by the presence of pipes in the ground unless the pipes are connected with the rails.

In Manchester the maximum drop in the rails is 2·0 volts in normal working; a most careful search of the Manchester system affords no evidence of currents flowing in the pipes. After overcoming the resistance in the first 3 ft., the current becomes diffused over such a wide area that practically no further resistance is opposed to its flow, so that a pipe situated over 3 ft. from the rails would carry little more current than if made of earth—and most pipes are a greater distance than this. Only in case of soil possessing a very high conductivity is there any danger of corrosion of pipes, and even in such a case, if the rail drop is kept low enough, the resistance of the pipe will prevent the flow of a heavy current. If the pipe be connected to the rails however, it acts as a large earth plate, and a heavier current flows along it.

Many waterworks engineers consider that, if their pipes in the danger zone show a high positive potential with regard to the rails, they are in danger; but the authors state that, the higher this potential, with a given rail drop, the safer are the pipes. It is impossible to judge of the safety or danger of a pipe from a knowledge of one p.d. only; there must be three simultaneous readings, with a constant current flowing in the rails, the measurements being made by a zero method, for which purpose the capillary electrometer is a useful indicator.

The authors consider that the risk of damage due to earth currents is very slight; the 7-volt limit imposed by the Board of Trade suffices to secure immunity from electrolysis, but other regulations might be amended with advantage. There is, for instance, no advantage in connecting the uninsulated return to the negative pole of the generator; the resistance of the earth plates need not be restricted to 2 ohms; and the provision that no pipe shall be positive to the rail by more than 1 volt, or negative to it by more than 3 volts, should be amended, as these limits are too low.

The greatest care should be taken at the car-shed, where damage from vagabond currents may easily be incurred; there should be a negative feed point outside the shed, the section containing the shed being made as short as possible.

As a result of their experiments the authors conclude that the general mass of the earth is at a uniform potential, and behaves like an almost perfect conductor. Owing to the magnitude of the vagabond currents, there is a much heavier current flowing in the trolley wires than in the rails, and it is the difference between these that causes magnetic disturbances at a distance from the track.

Discussion.

Mr. Miles Walker (chairman) thought the shape of the curve No. 3, fig. 2, must depend very much upon the size of plates, since, if they were big enough, the distance separating them would be small in proportion to the size of plates and the condition approached would be practically that shown in curve 1, fig. 2.

Mr. A. P. Trotter said the paper was an excellent mixture of theory and practice. The Board of Trade regulations were drawn up by Major Cardew, some 15 years ago, when nobody really knew much about it. They had effectually protected the gas and water pipes, but the time would come when they would have to be altered.

Fig. 2 was one of the most important in the paper. The suggestion that no electrolysis need be feared at a distance greater than 3 ft. was borne out by experience. The two most marked cases of damage that he knew of occurred within 2 ft. of a rail. Mr. Hancock, the electrical adviser to the Government of Western Australia, said that the only regulation about electrolysis that his Government had made was that no pipe should come within 2 ft. of the rail. If he remembered rightly, there was not a single case on record in this country of a pipe being corroded where the Board of Trade regulations had been observed, and tests carried out. Generally speaking, the 2-ft. rule was an excellent one. He had found on the Cape Town tramways that about 70 per cent. of the current went through the rail, corresponding with Mr. Parshall's figure. With regard to the practice of connecting the rails to the pipes, there were scores of cases where bonding had been put in, and incipient electrolysis had been thus stopped, and, therefore, it was not quite right to say it was not the practice in this country to make this connection. An electrolytic survey was a very interesting matter, and he thought it was sometimes worth while to make such a survey.

Prof. W. W. Haldane Gee thought that the reason for making the trolley wire + was the improved insulation obtained thereby. It was well known that on a three-wire system the + lead always tested out better than the — lead.

Mr. C. J. Beaver agreed that earth conductivity was of an electrolytic nature. The effect of the 7-volt limit of rail drop imposed by the Board of Trade Tramway Regulations had been all in the right direction, without constituting an appreciable drawback to the development of electric tramways. The electrolytic corrosion of pipes and cable sheaths by vagabond currents from tracks in this country, had been due to causes which could be classified under three general headings, viz.:—

1. Where the rail drop had been in excess of the 7-volt limit.
2. Abnormal soil conditions.
3. Where the arrangement of pipes or lead-covered cables had been such that they afforded a path of less resistance for return current than the tram-rails.

Regarding the third heading, he instanced cases where lead-covered cables passed under tramway tracks practically at right angles, and ran to the generating station by a much shorter route than the track. Such danger zones as these were cases where electrolytic corrosion was best avoided by direct bonding.

Mr. C. F. Smith, referring to the statement that if the earth plates were sufficiently far apart, the resistance between them would become zero, thought the authors should have said that the resistance per yard approached zero as the distance increased, since the increased resistance at the plates was only decreased slightly by increase in distance. The authors had not mentioned the action on pipes crossing the rails at right angles, which passed through several of the equipotential surfaces described by the authors, and would, therefore, be liable to carry currents.

Mr. A. Magnall said he had on many occasions made special efforts to find signs of electrolysis, but there was little to fear from electrolysis in Manchester.

Mr. J. S. Peck spoke of numerous tests which he had carried out on single-phase railways in America, with a view to ascertaining the extent of leakage currents. The tests were made by spreading loops of wire in the fields adjacent to the track, thereby securing an inductive action which gave results showing that the leakage currents spead over a tremendous area. In consequence, the current density was very small indeed, and no trouble was experienced electrolytically. Telephone troubles, however, were numerous and serious, and not until Mr. Scott introduced his well-known system of neutralising coils did they succeed in securing immunity from trouble in this direction.

Mr. S. L. Pearce thought that the freedom of Manchester from electrolytic troubles was due to the importance attached to insulated returns. Two ½-in. feeders, positive and negative, had been adopted in the original scheme, and this was found very serviceable, as, in case of a breakdown of one feeder, the other could be used temporarily; and further, it was possible to double the section of any one feeder if desired.

Mr. C. L. E. Stewart cited a case where a 3-in. cast-iron water pipe, crossing under a tramway, was corroded so badly that it ultimately burst, and in some places the wall of the pipe was reduced to the thickness of paper.

Mr. Julius Frith did not think the curves bore out the suggestion of the authors, that the resistance would become zero if the distance were infinite, nor did he see any justification for the statement that there was no gain in conductivity in increasing the area of the earth plates beyond 6 sq. ft.

Mr. T. H. M. Swinburne endorsed Mr. Parshall's figure of 60 per cent. vagabond current from his experience on a 3-mile track.

Mr. A. K. Bentley suggested that in certain cases, by a judicious use of iron templets and filings, a vivid picture of the leakage lines between rails and pipes could be made, and these might be useful before making an actual survey.

The Authors, in reply, said that if the rail drop were kept low the resistance of a pipe would prevent a heavy flow of current. Larsen and Faber stated that a pipe of 9 in. internal diameter and 5 in. thick had a resistance of 0·09 ohm per mile, exclusive of joint resistance, and these figures had been corroborated. Regarding joint resistance, the following figures were given:—

Gas-pipe joints 0·08-1,200 ohms (average 330 ohms).
Water-pipe joints 0·02-115 ohms (average 14 ohms).

They had found a resistance of 25-30 ohms between 12-ft. lengths of 6-ft. piping buried in the ground, end to end, and separated only by ½ in. If very large square plates were used, the potential gradients given on Curve 3, fig. 2, would, especially at short distances, become similar in shape to Curves 1 and 2, but the surfaces encountered in practice were strips rather than plates, and, however great the area, they had found the 3-ft. limit to apply. In the case of an A.C. traction system, the impedance offered to the flow of such current at the rails would be much higher than the resistance to the flow of an equivalent continuous current, so that the vagabond current, other conditions being similar, would be increased. There were undoubtedly many cases, where pipes passed close to the rails, in which incipient electrolysis might be prevented by bonding, but this action immediately put other pipes in danger, and the authors would much prefer an insulated joint placed over 3 ft. from the track; the joint might consist of a length of earthenware pipe. In the case of tube railways, care should be taken that no metallic connection existed between the track and tube except at the negative feed point, when the two should be bonded together, the sections of the tube being bonded as at present. If the polarity of the trolley wire were to be determined by endosmose only, the wire would be made negative, as the authors had shown that the failure of primary insulators were entirely due to endosmose and would be prevented by reversing the polarity of the lines. They had found all soils to be insulators when dry, so that the conductivity was entirely dependent upon the presence of water in which salts were dissolved. It did not make any difference whether pipes ran parallel to or across the rails—if they were situated 3 ft. away, no harm was likely to result. Mr Magnall's statement regarding freedom from electrolysis in Manchester was supported by Mr. Haynes, the water mains superintendent, who stated that the electrification of the tramways some nine years ago had not affected the corrosion of the pipes.

SEWAGE PUMPING AT MILTON, WESTON-SUPER-MARE.

This is an interesting example of pumping by electricity from a low-lying district into the main sewer, and now that electric power is available in nearly every town of any size, it is extremely likely—in fact, certain—that this method of solving the difficult problem of disposing of sewage in small, or comparatively small, low-lying districts will be very largely used.

If this method had been available in the past, it would often have saved enormous expense in laying very deep sewers to deal

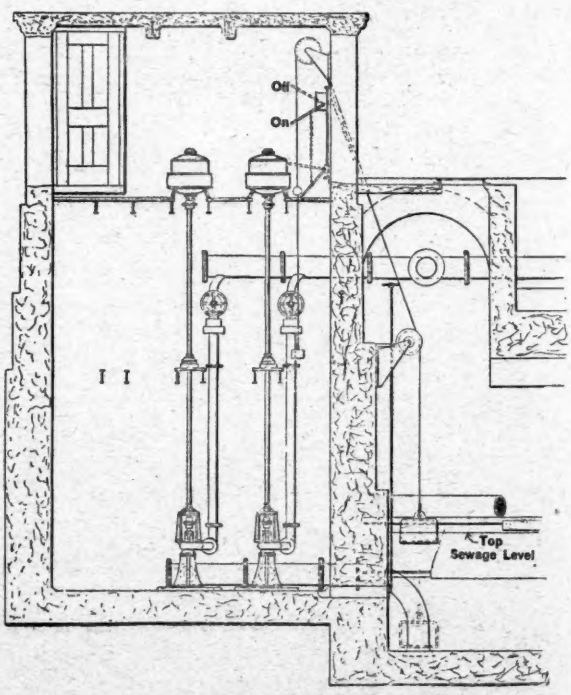


Fig. 1.—Arrangement of Plant.

with such places, and in future schemes no doubt this will be taken into consideration. Electric motors, when made by first-class makers, in these days are so reliable that no apprehension need be entertained as to the success of the electrical part of the work, and nothing could be simpler than a modern centrifugal pump.

Mr. A. E. Collins, the city engineer of Norwich, has recognised the great possibilities of electric power for this purpose, and is using it extensively at Norwich, whilst as consulting engineer for the Weston-super-Mare Urban District Council he designed the station that we now describe, with the assistance of Messrs. Laurence, Scott & Co., Ltd., of Norwich, as regards the electrical portion of the work.

Messrs. Laurence, Scott & Co. have for some years given great attention to vertical-spindle motors, and to transmitting power from these vertical-spindle motors to centrifugal pumps with submerged impellers, and also to the automatic operation of electric motors. These are the three problems that are of importance as far as the electric driving of these pumps is concerned.

For automatic working, the centrifugal pumps must obviously have their impellers drowned, as this is the only reliable way of arranging for a centrifugal pump to be self-starting.

It will be seen from the drawing, fig. 1, that the sewage is delivered into a screening chamber of a capacity of about 7,000 gallons, which is provided with a very effective cast-iron screen, with ½-in. holes. The sewage is drawn from this chamber by the two centrifugal pumps through a common suction pipe as shown. A sluice-valve is placed in the branch to each pump, so that either of the pumps can be disconnected.

The pumps are by Messrs. John Cherry & Sons, of Beckside, Beverley. They deliver through automatic reflux or retaining valves and sluice-valves into the sealed main, where there is a second reflux valve.

The electrical gear is operated by means of a float as shown. The ball on the chain in the pump chamber works a specially-designed quick-make-and-break switch. This makes and breaks a

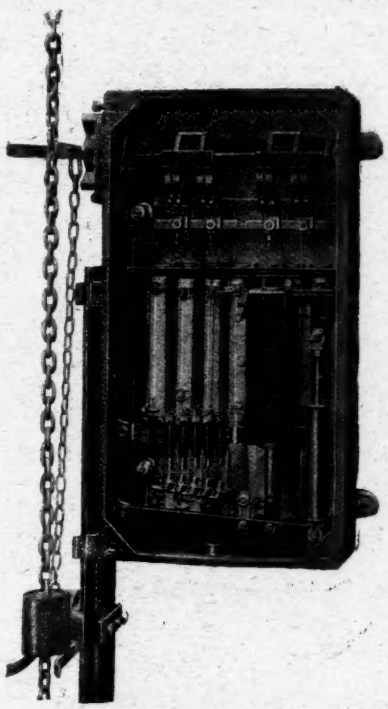


Fig. 2.—Automatic Starting Switchgear.

relay circuit operating one of Laurence, Scott & Co.'s carbon-arm automatic starters of the kind shown in the lower part of fig. 2. This particular starter, however, is a later design, and has a float-operated quick-make-and-break switch combined with it as shown. The carbons in the lower arm, which is lifted by the solenoid, are fixed. The upper ones can slide in the contact-boxes that are clamped on to the insulated bar as shown. Each of these upper carbons is pressed down by a spring in the box, but is restrained by means of a metal rod, which is screwed into it, going through the top of the box, and being provided with the adjusting nuts as shown. These adjusting nuts also fix the pigtail connections.

It is important to note that these contacts are only used for "shorting" the resistances. They are never opened with current on, or, of course, there would be considerable arcing that would in time burn these carbons away, although the burning effect would be far less destructive on these carbons than it would on any form of metal contact. However, as these carbons only "short" the resistances, they are found to last indefinitely. On very heavy duty there is sometimes found a slight flash or glow, but this is so momentary that it does no harm.

Except in the smallest sizes, the main circuit is always broken while these carbons are in contact, either by the main float-operated switch or by a relay switch provided with efficient magnetic blow-out arrangements, so that the carbon-arm comes down after this when no current is on.

This arrangement of rheostat has been found to be perfectly successful under the most difficult conditions, such, for instance, as driving planing machines, where it has to be operated under heavy current some thirty times a minute. It lends itself to the system of micanite insulation, which is used throughout in all this switchgear, viz., that involving the use of micanite troughing, which surrounds either the "live" or the "dead" part, the other part being clamped to it. This form of insulation is considered by the makers to be superior to any form involving slate or marble, or even micanite bushes, which are always a source of weakness. Messrs. Laurence, Scott & Co. have developed this system of insulation during the last five or six years in connection with the special switchgear they manufacture, and they now have a shop with upwards of a hundred employés working entirely on this kind of work.

FOREIGN AND COLONIAL TARIFFS ON ELECTRICAL GOODS.

CANADA.

(*Concluded from page* 539.)

Iron or steel pipe, not butt or lap-welded, and wire-bound wooden pipe, of not less than 30 in. internal diameter, when for use exclusively in alluvial gold mining	5% ad val.
Crucible cast-steel wire, valued at not less than 6 cents per lb.	free
Galvanised iron or steel wire, curved or not, numbers 9, 12 and 13 gauge	10% ad val.
Wire of all metals and kinds not separately mentioned in the tariff	15% ad val.
Wire, single or several, covered with cotton, linen, silk, rubber or other material, including cable so covered	20% ad val.
Railroad spikes	30 cents per 100 lb.
Lamps, sidelights and headlights, lanterns, chandeliers, gas, coal, oil or other lighting fixtures, including electric light fixtures or metal parts thereof; lava or other tips, burners, collars, galleries, shades and shade-holders	20% ad val.
Locomotives and motors for railways and tramways	22½% ad val.
Belt pulleys of all kinds for power transmission	15%
Telephone and telegraph instruments, electric and galvanic batteries, electric motors, dynamos, generators, sockets, insulators of all kinds; electric apparatus not separately mentioned in the tariff; boilers not separately mentioned in the tariff; and all machinery composed wholly or in part of iron or steel not separately mentioned in the tariff; and iron and steel castings, and iron or steel integral parts of all machinery specified in this item	15%
Note.—This heading includes electric buzzers, electric conduit of paper, bituminised for insulating wires, electric fuses, if not covered wire, push buttons for electric bells, electric switchboards (finished), electric travelling cranes, with or without motors.	
Locomotive and car-wheel tires of steel in the rough	free
Brass caps adapted for use in the manufacture of electric batteries	free
Asphalt or asphaltum, solid; bone pitch, crude only; and resin or rosin in packages of not less than 100 lb.	free
Coal and pine pitch, burgundy pitch; and coal and pine tar, crude, in packages of not less than 15 gal.	free
Coal, anthracite; anthracite coal dust; coke	free
Bituminous slack coal, such as will pass through a ¾-in. screen, subject to regulations prescribed by the Minister of Customs	10 cents per ton
Coal, bituminous, round and run of mine, and coal not separately mentioned in the tariff	35 cents per ton
Railway cars or other cars	20% ad val.
Belting of leather	15% ad val.
„ other	20% ad val.
Rubber and gutta-percha, crude caoutchouc or india-rubber, unmanufactured; powdered rubber and rubber or gutta-percha waste or junk; hard rubber in sheets but not further manufactured, and re-covered rubber and rubber substitute	free.
India-rubber boots and shoes	15%.
Rubber cement and all manufactures of india-rubber and gutta-percha, not specially mentioned in the Tariff	15%.
Electric or magnetic machines for separating or concentrating iron ores	free.
Scientific apparatus when imported for use in colleges, schools, and scientific societies	free.
Phosphor-bronze wire	5% ad val.
Note.—No person may establish any wireless telegraph station, or install or work any apparatus for wireless telegraphy in any place or on board any ship registered in Canada, except under licence granted by the Minister of Marine and Fisheries with the consent of the Governor in Council.	

New Map.—Mr. Edward Stanford, of Long Acre, has issued another of his useful maps. It shows the metropolitan railways, tramways, and miscellaneous improvements deposited at the L.C.C. up to November 30th last for the 1909 Session. In sheet form the price is 2s., but it is also issued mounted in case at 4s.

NEW PATENTS APPLIED FOR, 1909.

Compiled expressly for this journal by W. P. Thompson & Co., Electrical Patent Agents, 322, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

6,106. "Improvements in electrical resistances applicable for electrical heating, cooking and other purposes." G. Cooper and F. C. Sharp. March 15th. Complete.)

6,111. "Totally de-energising overhead dangerous electrical wires the moment they snap." D. P. F. Ghadiali. March 15th.

6,151. "Improvements in electric cables." J. Stratton and E. A. Claremont. March 15th.

6,161. "Improvements in electric insulators." P. Rutzky. March 15th.

6,177. "Improvements in dynamo-electric machinery." The Hon. C. A. Parsons, G. G. Stoney and A. H. Law. March 15th.

6,186. "Improvements in and relating to the control of electrically-propelled vehicles." British Thomson-Houston Co., Ltd., and W. Park. March 15th.

6,187. "Rotary field magnet consisting of separate permanent bar magnets for multipolar electrical machines having stationary armature." E. Volkers. (Date applied for under Sec. 91 of the Act April 23rd, 1908, being date of application in Germany.) March 15th. (Complete.)

6,191. "Automatic cut-out and current regulator." M. H. Goldstone. March 16th.

6,248. "Improvements in and relating to accumulator plates." Accumulatoren Fabrik Akt.-Ges. (Date applied for under Sec. 91 of the Act, December 31st, 1908, being date of application in Germany.) March 16th. (Complete.)

6,258. "Improvements in apparatus for plotting magnetic lines of force and for like purposes." T. Parkes. March 16th.

6,267. "Apparatus for electro-magnetic separation." F. Steinert and H. Stein. (Application for Patent of Addition to No. 6,323 of 1908.) March 16th. Complete.)

6,278. "Improvements in electric insulating and water-proofing compositions." T. Marriott and H. S. M. Grover. March 16th.

6,281. "Improvements in telephone exchanges." Siemens Bros. & Co., Ltd. (Siemens & Halske Akt.-Ges., Germany.) March 16th. (Complete.)

6,289. "Improvements in automatic electric block signal systems." H. W. Price. March 16th. (Complete.)

6,312. "Improvements in and relating to dynamo-electric machines." Allgemeine Elektricitats Ges. (Date applied for under Sec. 91 of the Act, March 17th, 1908, being date of application in Germany.) March 16th. (Complete.)

6,313. "Improvements in and relating to electric transformers." Allgemeine Electricitats Ges. (Application for Patent of Addition to No. 92/09. Date applied for under Sec. 91 of the Act, March 17th, 1908, being date of application in Germany.) March 16th. (Complete.)

6,317. "Improvements in apparatus for the production of electric power." P. C. Day and Bernhard Wiesengrund, Power Plant Co., Ltd. March 17th.

6,326. "Improvements in primary batteries." F. Richmond. March 17th.

6,328. "Improvements in and relating to the plot point and controlling mechanism of the conduit system of electric traction." J. W. Lincoln. March 17th.

6,342. "Improvements in conduit joints and joint boxes. W. R. Sykes and C. J. Cooke. March 17th.

6,347. "Improvements in gas and electric light fittings." S. Gratrix, Jun., and Brother, Ltd., and A. Harrison. March 17th.

6,351. "Improvements in bridge pieces for electric fuse boxes." A. Russell. March 17th.

6,398. "Improvements in and relating to the manufacture of refractory electric conductors." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) March 17th.

6,405. "Improvements in automatic electric switches." E. R. Grote. March 17th.

6,419. "Improvements in magnetic clocks and timing mechanism." E. V. Gratge. March 17th.

6,424. "Apparatus for producing but very slightly damped electrical oscillations." W. P. Thompson. (Ges. für Drahtlose Telegraphie m.b.H., Germany.) March 17th. (Complete.)

6,429. "Improvements relating to the working of electric arcs in series." H. Pauling. March 17th. (Complete.)

6,443. "Improved high potential primary battery." W. S. Tucker. March 18th.

6,447. "Improvements in the enumeration of telephone calls." S. D. Williams. March 18th.

6,477. "Improvements in and relating to the rotors of alternating-current dynamo-electric machines, especially applicable to induction motors." Lancashire Dynamo and Motor Co., Ltd., and A. R. Stelling. March 18th.

6,495. "Improvements in electric safety mechanism for the doors and gates of electric lifts and hoists and the like." J. C. Etchells. March 18th.

6,504. "Improvements in apparatus for metering and transforming electrical energy." E. Wilson and W. H. Wilson. March 18th.

6,523. "Improvements in telephones." A. H. Nicholson. March 18th. (Complete.)

6,525. "Improvements in and relating to receiving instruments for electric telegraphy." T. Clark. March 18th. (Complete.)

6,534. "Improvements in and relating to overhead conductors for electric railways and tramways." J. Ormston and W. E. Charlton. March 18th.

6,564. "Improvements in and relating to electric motor control." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) March 18th.

6,565. "Improvements in and relating to electricity meters." British Thomson-Houston Co., Ltd., and C. R. D'Arcy. March 18th.

6,566. "Improvements in and relating to the control of electric motors." Allgemeine Elektricitats Ges. (Date applied for under Sec. 91 of the Act, March 18th, 1908, being date of application in Germany.) March 18th. Complete.)

6,567. "Improvements in systems of motor control." H. E. White. (Date applied for under Sec. 91 of the Act, May 18th, 1908, being date of application in United States.) March 18th. (Complete.)

6,574. "Automatic electrical depth recorder." D. Ireland. March 19th.

6,599. "Speed limit switch for internal combustion engine with high-tension magnets for motor-cars." D. J. Davies and E. R. Evans. March 19th.

6,601. "Electric light or gas illuminating frame for lighting from the front during dark hours any object enframed." F. Geller. March 19th.

6,673. "Improvements in speed indicators for electric motors." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) March 19th.

6,674. "Improvements in and relating to electric resistance units." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) March 19th.

6,675. "Improvements in and relating to polyphase relays and the like." Allgemeine Elektricitats-Ges. (Date applied for under Sec. 91 of the Act, March 19th, 1908, being date of application in Germany.) March 19th. (Complete.)

6,691. "Improvements in motor-generators for use with electric accumulator batteries." A. M. Taylor. March 20th.

6,695. "Improved ceiling rose for use in the wiring of houses, buildings, and the like for electric lighting and other current consuming apparatus." N. McLean. March 20th.

6,720. "Electrically-operated slide valve for internal combustion engines." F. Summerhayes. March 20th.

6,749. "Improvements in and relating to electric heating devices." British Thomson-Houston Co., Ltd. (General Electric Co., United States.) March 20th.

6,752. "Improvements in and relating to electrical generating sets driven by wind or like fluctuating power." J. G. Childs and T. S. Hill. March 20th.

6,758. "Improvements in and connected with electrical transmission of power and speed regulation for automobiles, road or rail trams, locomotives, hauling, hoisting, winding gear, and the like." W. P. Durtnall. March 20th.

PUBLISHED SPECIFICATIONS.

Copies of any of these Specifications may be obtained of Messrs. W. P. Thompson & Co., 322, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1908.

Secondary Battery. P. Schreiber. 105. January 2nd. (Post-dated July 17th, 1908.)

Electrolytic Electricity Meters. W. M. Mordey and G. C. Fricker. 3,995. February 22nd.

Automatic Targets whereby an Indicator is Shown and Electric Bells are Set Ringing. W. Hardy. 4,002. February 22nd.

Electric Arc Lamps. H. Baggett. 4,212. February 25th.

Röntgen Tubes and the like. A. F. Lindemann and F. A. Lindemann. 4,479 February 27th.

Electric Locking and Interlocking Indicating Push-Button Switch Primarily Designed for Use in Connection with Push-Button Operated Electric Lifts. A. H. Curtis, A. H. Mackley and Adams Manufacturing Co. 4,696. March 2nd.

Electric Signalling Apparatus for Railways. H. R. Richardson. 4,717. March 2nd.

Electric Sound Producing Apparatus. L. Savart and J. Graindorge. 5,089. March 6th. (Date applied for under International Convention, October 31st, 1907.)

Portable Electric Accumulators. L. Bristol. 5,097. March 6th.

Circuits for Simultaneous Telegraphy and Telephony and the like. H. H. Harrison and British Insulated & Helsby Cables, Ltd. 5,137. March 6th.

Electric Meters. A. Horstmann and Horstmann Gear Co. 6,008. March 18th.

Secondary Electric Batteries or Accumulators. W. Moseley. 6,388. March 21st.

Electric Conductors and their Fittings to Prevent Access of Water or Moisture Thereto. E. L. Berry and F. Harrison. 6,753. March 26th.

Surface Condenser Systems. Warwick Machinery Co. (General Electric Co., United States.) 7,326. April 2nd.

Electrically-Heated Apparatus Suitable for Cooking and other Purposes. A. F. Berry. 13,107. June 19th.

Electric Meters. British Thomson-Houston Co., F. C. Carter and A. J. Martin. 13,787. June 29th.

Telephones. H. Hadida. 13,982. July 21st.

Electric Heating Devices. British Thomson-Houston Co. (General Electric Co., United States.) 14,537. July 8th.

Apparatus for Electrically Heating Running Water. G. Fuller and L. Fuller. 14,817. July 13th.

Electric Selective Systems. P. D. Pearne. 15,470. July 21st.

Electro-Chemical Process for Cleaning and Polishing Silver Plate and the like. A. M. Kohler. 15,962. July 27th.

Process for Preparing, Smelting and Utilising Various Products Containing Tin, Particularly the Metallic Sponge and Slime Obtained in the Electrolytic Removal of Tin from Tin-Plate Scrap. R. Mennicke. 16,428. August 5th.

Telephone Apparatus. C. F. Bradburn. 17,206. August 15th. (Date applied for under Rule 13, February 25th, 1908.)

Electrically-Operated Cranes, Lifts and the like. Allgemeine Elektricitäts Ges. 17,622. August 21st. (Date applied for under International Convention, August 23rd, 1907.)

Telephone Indexes. F. O. Watson and H. Eaton. 18,905. September 9th.

Manufacture of Electrical Glow Lamps with Metal Filaments. T. McKenna. (Gluhlampenwerk Anker Ges.) 19,118. September 11th.

Aerial Electric Cables. C. E. Egner and R. F. Fredriksson. 28,053. December 2nd. (Date applied for under International Convention, December 2nd, 1907.)

Bottom-Loop Lamps in the Navy.—A serious explosion occurred in one of the coal bunkers of the new battleship *Bellerophon* while alongside the south railway jetty in Portsmouth Dockyard. A party of dockyard workmen had been sent down to investigate a reported defect in the electric light wiring in the bunkers, and in accordance with the Admiralty regulations they carried an electric lamp, naked lights being forbidden. As soon as the door of the bunker was opened, an accumulation of coal gas burst into flame, throwing the men down and burning two of them severely. It is believed that the gas was ignited by an electric spark occurring at the lamp connections. This is a danger which arises from the employment of the old-fashioned loop lamps, which are in such general use in the navy. In a hand lamp especially, unless the spring hooks are kept rigidly up to their work, there is always the possibility of a slight jar temporarily disconnecting one of the loops, and thus causing a spark. Bayonet joints are now coming into favour, but it was a long time before the Admiralty could make up their minds to discard the older pattern of connection. Meanwhile, it would be well to remember that in coal bunkers and places generally where a spark is to be avoided, the bayonet-jointed lamp has the advantage.